This Issue: Advance Papers Del Monte Convention, Pacific Coast Section, N. E. L. A.

BUY A LIBERTY BOND

JOURNAL OF ELECTRICITY

VOL. 40 NO. 7 SAN FRANCISCO, APRIL 1, 1918 PER COPY, 25 CENTS

(Reproduced from Hotpoint Ads)

Hotpoint

nationwide publicity to help conserve fuel, food, labor and transportation, reaches over

73,000,000

readers of leading publications.

Certainly a tremendous factor in arousing your patrons to appreciate ELECTRICITY and Hotpoints.

Hotpoint Advertisements for the first half of 1918 appear in:

	Readers
Saturday Evening Post	
May 4, two-page, 2-color, center spread	9,936,661
June 29, two-page, 2-color, center spread	9,936,661
Feb. 23, full page	9,936,661
March 9, full page	6,937,661
Ladies' Home Journal	
May 1, full page, 4 colors	8,216,122
June 1, full page, 4 colors	8,216,122
Good Housekeeping	
May 1, full page, 2 colors	2,025,000
July 1, full page, 2 colors	2,025,000
Literary Digest	
Feb. 16, full page	4,550,000
March 2, full page	4,550,000
March 16, full page	4,550,000
Total number of readers	73,878,888

LIBRARY OF CONGRESS

Do your duty to yourself and country

——help conserve by increasing the use of Hotpoints because they enable your patrons to conserve the most convenient way.

The Service qualities of Hotpoints—coupled with Hotpoint National Advertising, effective selling helps (provided by us) supported by your energetic local sales work—means

—quick turnover
—low selling cost
—minimum investment and most important of all

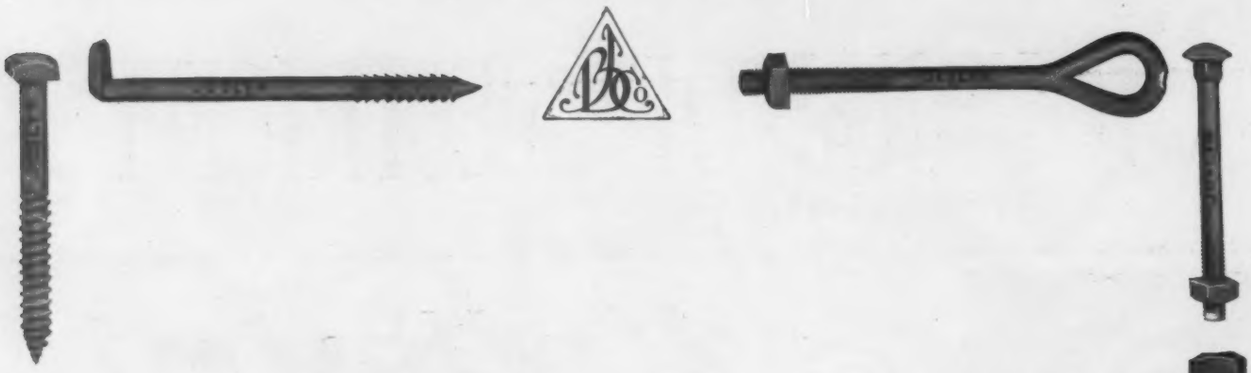
Satisfactory Profits and Satisfied Customers.

Write us for further particulars—

HOTPOINT DIVISION

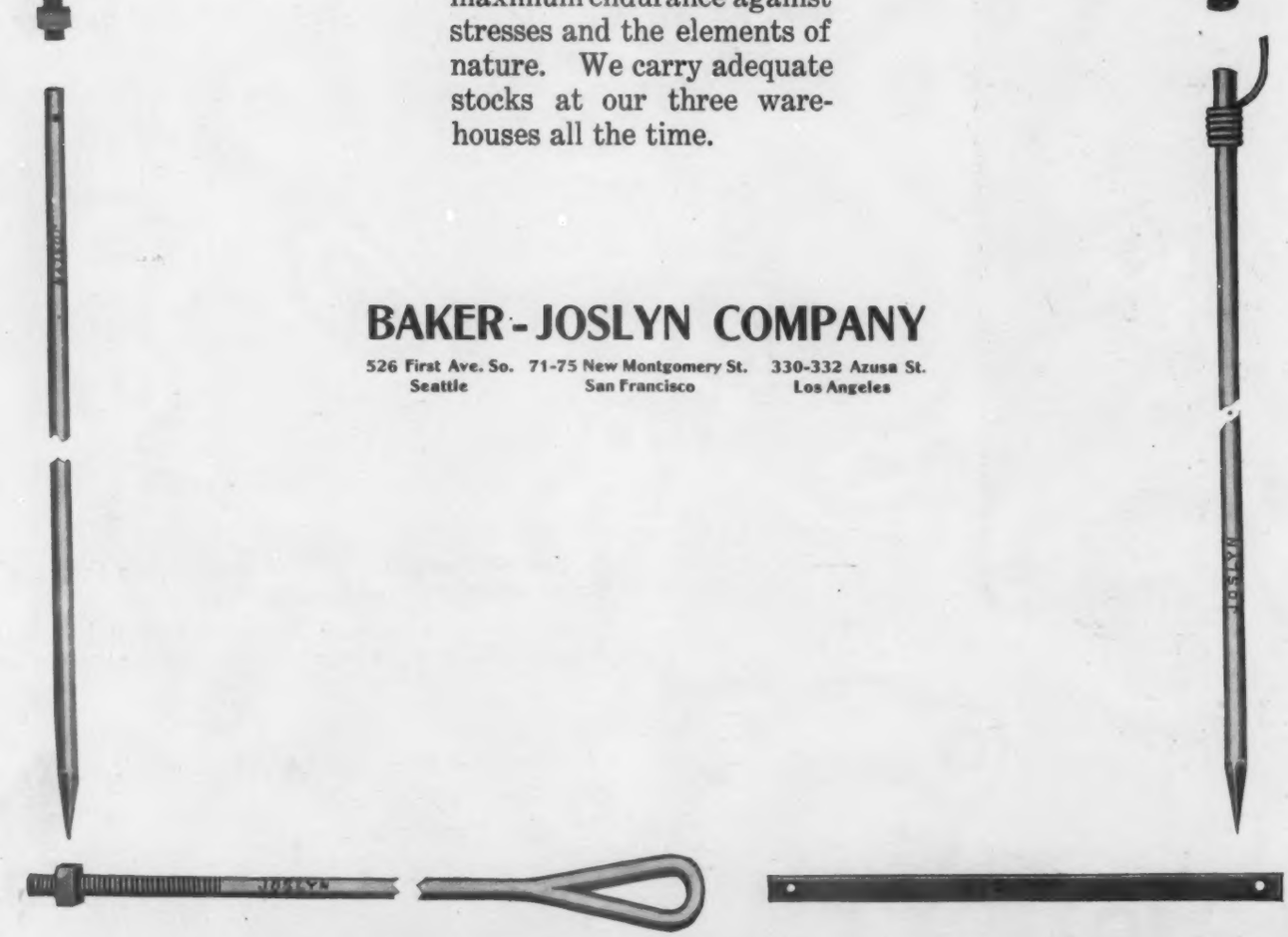
Edision Electric Appliance Co., Inc.

Chicago New York Ontario, Calif.



ON ALL SIDES

you will find "JOSLYN" Hot Galvanized Pole Line Hardware used—insuring stability of construction and maximum endurance against stresses and the elements of nature. We carry adequate stocks at our three warehouses all the time.



BAKER-JOSLYN COMPANY

526 First Ave. So. Seattle
71-75 New Montgomery St. San Francisco
330-332 Azusa St. Los Angeles

JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor — CLOTILDE GRUNSKY, Associate

VOLUME 40 — SAN FRANCISCO, APRIL 1, 1918 — NUMBER 7

Contents

CALIFORNIA ELECTRICAL CO-OPERATIVE CAMPAIGN 326

An impressive gathering of electrical men in Southern California who pledged themselves to co-operative effort for the good of the industry.

WATER RESOURCES IN SOUTHERN CALIFORNIA—*by H. A. Barre* 330

The plans of interconnection and new development which are to meet the war needs of fuel conservation with the increased demand.

STANDARDIZATION OF PIN TYPE INSULATORS—*by L. M. Klauber and R. E. Cunningham* 333

Recommendations for standardized types which will unify the practice of power companies similarly situated and permit economies on all sides.

IRON AND STEEL CONDUCTORS—*by R. C. Powell* 338

A timely study of the numerous problems which have arisen in the forced use of iron and steel as conductors owing to the scarcity of copper.

POWER PLANT LOSSES—*by R. J. C. Wood* 344

Economies of the power plant as practiced by the Southern California Edison Company as a war measure in the saving of electrical energy.

TRANSMISSION AND DISTRIBUTION LOSSES—*by R. E. Cunningham* 349

A study of the losses met with from various sources on distribution and transmission lines, and suggestions as to the method of meeting them.

RETAIL SELLING PRACTICE—*by H. F. Allen, E. B. Criddle, H. A. Lemmon, M. L. Scobey and L. H. Newbert* 351

A handbook of rules and suggestions from the Western standpoint, which should be in the possession of every electrical dealer.

DEVELOPMENT OF THE COMMUNITY OF INTEREST—*by T. E. Bibbins* 358

A plea in the spirit of the times for co-operation in all departments of the electrical industry.

EDITORIALS 323

Synergy—A Suggestion for Practical Co-operation—Water Power Taxation—A Bit of Financial History—Maintenance of Public Utility Credit—Inter-Allied Conference on Standards—The Semi-Centennial in California—The New Journal Service.

Launching the Co-operative Campaign — Frontispiece 322
Affiliation—by G. E. Arbogast 326
Co-operation—by D. J. Butts 327
Electricity in Logging and Saw Mills 343
A Hint to the Trade in Cuba 348
Business Conditions in Russia Today 350
The Store 351
A Street Scene with an Object Lesson 352
An Attractive Window 354
The Cost of Doing Business 355
Surprise Tests 357
Co-operative Electrical Work in the Inter-Mountain Country—by U. S. G. Todd 357
Power on the Farm 358
What Western Inventors Are Doing—by Wm. K. White and H. G. Prost 360
Sparks—Current Facts, Figures and Fancy 362
Personals 363
Meeting Notices for Electrical Men 366
Builders of the West—XXVI—S. M. Kennedy 366
Where Men of the Industry Meet 367
Happenings in the Industry 369
Latest in Everything Electrical 371
New Electrical Developments 373

ON LIBRARY CARS OF ALL SOUTHERN PACIFIC LINES

TERMS OF SUBSCRIPTION: United States, Cuba and Mexico $2.50 per year; Dominion of Canada $3.50 per year; elsewhere $5.00 per year; Single Copies, current month 25c each.

PUBLISHED SEMI-MONTHLY BY THE

TECHNICAL PUBLISHING COMPANY

CROSSLEY BLDG., SAN FRANCISCO — 165 Broadway, New York City — 123 W. Madison St., Chicago, Ill.

EDWARD B. STRONG, PRESIDENT
WILLIS M. DEMING, V. P. AND GENERAL MANAGER
ROBERT SIBLEY, SECRETARY-TREASURER
ARTHUR H. HALLORAN, ASSISTANT BUSINESS MANAGER

Index to Advertisers—page 16 Where to Buy in the West—pages 17-23

HERE is a gathering of three hundred prominent men of the electrical industry—a past president of the American Institute of Electrical Engineers, a founder of a great electric appliance manufacturing establishment, the commercial agents of the two greatest hydro-electric central stations in the world, the designer of the most beautiful system of electrical illumination known to history, and a host of other men of equal prominence—gathered together in Los Angeles, March 15, 1918, for the purpose of launching a co-operative electrical campaign that is as potential in its possibilities for the future as it is unique in its organization at the present. The setting of such ideals as these mark the dawning of a new era in the commercial and industrial life of the nation that—like the ripple in the great ocean caused by the dropping of a stone—will eventually pass even to foreign shores and make its effect felt in the modeling of a better and more efficient world. Such ideals of democracy will eventually prove more powerful than any other factor in the bringing of permanent world peace.

APR -5 1918

©CLB411331

JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 40 SAN FRANCISCO, APRIL 1, 1918 Number 7

[COPYRIGHT 1918 BY TECHNICAL PUBLISHING COMPANY]

Synergy—

Recent developments in affairs electrical upon the Pacific Coast have witnessed the establishment of a new era of co-operative effort among all branches of the industry. The general unsettled conditions that have prevailed in the electrical industry in the past may in some respects be likened to the conditions that are still keeping world affairs in a state of ferment.

The electrical industry during the past quarter of a century has grown so rapidly and to such gigantic bounds that today the invested capital may well be placed among the four or five great divisions of national financial strength. Due to the vast expansion of electrical application in countless commercial and industrial uses, the continued harmonious development of this great industry is as a consequence of vital interest to the nation as a whole at this critical period.

Much has appeared in the press of late relative to the necessity of opening up the great natural water powers of the nation as well as the necessity of maintaining the financial credit of public utilities concerned with electric generation and distribution. Little has, however, appeared concerning the many complex questions involving all branches of this great industry, the solution of which might well bring about a more harmonious workable relation in developing the industry. When it is realized that gigantic savings in the cost of production and distribution, as well as a vast extension of the uses of electrical energy are possible under co-ordinated effort, the problem not only becomes one of intense interest to the several branches of the industry itself, but due to the necessity for conservation of national strength on all sides, it at once assumes an importance that might well attract the interest of the public generally. Especially is this true when the same co-operative ideals might well be applied to many other channels of national effort.

Some years ago there originated in the West a movement for the co-ordination of the problems of the electrical contractor-dealer in the merchandising of electrical ware. This movement, now known as the Goodwin plan, in recognition of the active and valuable work done by W. L. Goodwin in assisting to make it effective, proved so helpful that it has in recent months been promulgated throughout the width and breadth of the nation. This effort is today meeting with wide approbation on all sides.

In recent months there has again been evolved in the West a plan for a co-operative electrical campaign that bids well to bring about still greater possibilities in work of this nature, the result of which should vastly extend the uses of electrical energy and at the same time minimize the human effort involved.

The sum of $12,000 has been raised in California jointly by the manufacturers, jobbers, central stations and electrical contractor-dealers for the initial expense in carrying on a campaign of co-operative educational work. Two field agents have been employed who are to work under an advisory committee serving without salary, composed of men representing all branches of the industry, and who are eminently qualified to direct the difficult problems that may arise from time to time.

These field men are to work from one end of the state to the other, offering suggestions, gathering information, encouraging here and helping there, in every manner possible.

During the past few days a mass meeting has been held in Los Angeles, where some three hundred leaders in the electrical industry gathered from all sections of the state to launch this campaign of mutual helpfulness. Detailed accounts of what transpired at this meeting may be found on other pages of this issue.

Suffice it to say that to such a high degree were co-operative ideals raised that every one who attended this meeting went away feeling that the future has much in store from the helpful effects of this campaign.

It is clearly evident that it will be only a short period hence when such ideals of co-operative helpful-

In these momentous times it is well to bear in mind the three great rules necessary for the accomplishment of worth-while human tasks—patience, patience, patience.

ness will be extended by similar means not only to merchandising but to power conservation, fuel saving, and to financial and engineering problems generally.

Indeed, those who thoughtfully carry to its ultimate conclusion the helpful ideas brought out can not help but realize that this new movement is but ushering in a new ideal that must be brought into play in world problems generally, for by it only can many of the false ideals of socialism which are seemingly so prevalent at the present time be effectively met.

A Suggestion for Practical Co-operation

The West has now entered upon a new era of intensive co-operative helpfulness. At the recent remarkable meeting of electrical men in Southern California, described on another page of this issue, held for the purpose of instilling a higher, more effective spirit of mutual helpfulness, the toastmaster—one of the most prominent men of the electrical industry in the West—referred to the Journal of Electricity as a powerful instrument for good in the electrical industry of the West.

Here is a suggestion for practical co-operation. There are two distinct ways in which our readers can make this service of even more effective strength—by mentioning the good work of the Journal to your friends, and by patronizing its advertisers in every possible way.

The Journal of Electricity has for years carried in its advertising columns the highest grade of manufacturers of electrical ware known to the industry the country over. None but clean, clear-cut business firms are admitted to the privilege of advertising in its columns.

By patronizing these advertisers it enables them to broaden their excellent product and thus raise the industry to a higher state of perfection. Again, by mentioning the Journal of Electricity it increases its value as an advertising medium in direct proportion to the number of times it is mentioned. And best of all, there results through this patronage on the part of the reader a direct benefit to the reader himself, in that a periodical which thrives financially is enabled to give better and fuller service in its efforts to upbuild all that is good and wholesome in the electrical industry.

Water Power Taxation

In the recent discussions of new water power legislation at the national capital, sharp differences of opinion as to whether the government should make water power development a source of revenue have been brought to light.

Those who are most familiar with water power development, including engineers of the Forestry Bureau, representing Secretaries Baker, Houston and Lane, are advocating that it is better to count on reduction of rates to the consumer than on obtaining revenue for the government. On the other hand, certain Eastern legislators are insistent that water power development should be revenue producing on the grounds that the American people are now heavily taxed for the war, that additional money is needed and that the government should not shut itself off from such a profitable source of income.

Under the proposed bill the lessees of the water power would pay nominal rentals to the government with penalties in the form of higher rentals provided in the event of overcharge to consumers. Rates to be paid by users of the power would be fixed by a commission to be composed of the Secretaries of War, Agriculture, and Interior.

Only those who have followed closely the growth of water power development with its many obstacles that must be overcome, can appreciate the absolute necessity of the provision for nominal rentals even in ordinary times. But in these momentous days, when a power crisis faces the entire nation and when water power development means so much for the saving of fuel and the turning of the wheels of industry, it is rather surprising that any one questions the advisability of immediate action of unlocking the water power resources of the nation on the basis of nominal rentals, protected as they are to be with fair and proper provision for rates and repurchase on the part of the government, if desired at a reasonable period in the future.

A charge of ten cents per horsepower as a minimum and fifty cents as a maximum for the nominal rentals involved appear reasonable and proper. Indeed, the bills as now pending before Congress looking toward the solving of the present crisis in power development, with minor changes, offer entirely workable conditions.

A Bit of Financial History

The Third Liberty Loan, to be floated in April, will undoubtedly from its very patriotic appeal sweep all objections before it. But beneath the appeal to the emotions there is a soundness of business and financial standing that makes this series of loans a most valuable acquisition to every American citizen.

Statistics from the Treasury Department covering former governmental loans are interesting. The credit of the United States was so high and unquestionable that in 1900, two years after the Spanish War, 2 per cent bonds were offered at par and oversubscribed. This is a financial performance no other nation has ever equaled.

United States 4 per cent bonds in 1888 sold as high as 130 and in 1901 brought 139⅞ on the stock market.

The United States has never defaulted on any of its bonds. Not one of its bondholders has ever lost a cent of principal or interest except those who voluntarily have taken losses by selling their bonds in a period of temporary price depression. One hundred cents on the dollar, principal and interest, has the United States always paid.

Back of the $250,000,000,000 to $300,000,000,000 of our national resources stands the rugged honesty of America. Liberty Loan Bonds are the safest security in the world.

Maintenance of Public Utility Credit

Each day there is impressed upon the mind of every thoughtful citizen the necessity of the maintenance of public utility credit throughout the nation. In our last issue editorial comment was made upon the good that is bound to result from the recent written utterances of the Chief Executive along these lines.

In view of the situation in which utilities of the West are being placed by reason of rapidly increasing costs of operation which have made necessary a number of applications to the various state bodies for increased fares and rates, the following extract from the annual report of John Skelton Williams, Comptroller of the Currency, is extremely interesting and timely:

"The first and most direct relief to the public utilities corporations can be given by the state public utilities commissions and municipal and local authorities, with the broad-minded co-operation of the people generally, understanding the necessities of war and realizing that the more promptly its burdens are accepted the sooner they will be lifted. It is essential that forebearance and consideration be exercised by the state commissions and municipal authorities, and that the corporations also be permitted to make such additions to their charges for service as will keep in them the breath of solvency, protect their owners against unjust loss, and give them a basis of credit on which they may obtain the funds with which to meet the strain put on them by the Government's needs. The breakdown of these corporations would be a national calamity."

The possible breakdown of the public utilities that furnish our industries with power would mean even more serious national difficulties than were involved in the recent collapse of the railroads, for the crippling of industrial output would be sure to follow and the remedy is not so easy at hand when quality and continuity of service becomes impaired in the power supply.

Hence it is with extreme satisfaction that we view an increasing interest on the part of the national government and on the part of the state regulatory commission to grant relief by the raising of rates and thus maintain public utility credit on a workable basis.

Inter-allied Conference on Standards

An announcement of unusual interest has recently been sent out by the official bulletin at Washington—namely, the arrival in England of delegates from all the allied countries for conference on international standards. At this conference, consideration will be given to the standardization of manufacturing materials as related to the production of machinery, motors and aircraft.

The American delegation includes members from all the prominent engineering societies of the country. The purpose of this inter-allied meeting is to enable better industrial service to be given with less man-hour effort, through relieving plants from carrying in stock unstandard materials for which there is a small call, and concentrating on materials of known performance for the same work.

This movement may be characterized as one of the great good benefits that may be directly attributable to the present international war. It is interesting to note in passing that over a hundred years ago the beautiful standardization of fundamental units resulting in the establishing of the metric system, was a direct outcome of the awful throes of the French Revolution.

As far back as history bears record, the confusion of tongues resulting from diversity of methods and varying standards of design has caused calamities beyond number. Indeed, reading between the lines, it may well be inferred that the abandonment of the great engineering feat of Biblical record—the building of the tower of Babel—was perhaps directly attributable to this cause.

In the upbuilding of the commercial and engineering arena of the future—the Pacific ocean, its islands, and the lands washed by its waters—the early standardization of manufacturing materials, units of measurement, questions of design, facility for commercial exchange and a thousand other matters, must perforce prove of inestimable value.

This question of standardization is each day brought nearer and nearer home to engineers and men of the electrical industry in the West. The growing trade relations with Oriental and South American ports demand that every facility be given to improving standardization. Engineering and commercial bodies in the West would do well to take action looking toward some concerted effort in arriving at permanent understandings in standardization among all Pacific neighbors.

The Semi-Centennial in California

The past few days have witnessed in the West the celebration of the fiftieth anniversary of the University of California.

The twenty thousand sons and daughters of this great university are today carrying a wealth of inspiration and human sympathy, acquired in its halls, to every quarter of the globe.

The Journal of Electricity extends its greetings and best wishes to this fellow laborer in spreading the gospel of light to the uttermost places of the earth. In the West today the electrical industry is giving to the world at large new ideals in human endeavor and in human progress, and to her great institutions of learning is due lasting gratitude for the lion's share in this great accomplishment.

THE NEW JOURNAL SERVICE: The next issue of the Journal of Electricity will feature the remaining advance papers of the Del Monte convention of the Pacific Coast Section, N. E. L. A., the first series of which is set forth in this issue. Due to the fact that a remarkable electrical co-operative campaign has just been initiated in California that will undoubtedly set new records of accomplishment well worthy the thoughtful study of all men interested in the subject of merchandising, the Journal of Electricity has made arrangements to feature in successive issues, the progress of this unique campaign. Electrical men not only west of the Rockies, but throughout the length and breadth of the United States, should find these succeeding issues of the Journal of Electricity indispensable in value.

The volume of business with Eastern concerns has grown to such proportions in recent months that the Journal of Electricity has found it necessary to open offices in New York and Chicago, as announced on the page devoted to the table of contents.

CALIFORNIA ELECTRICAL CO-OPERATIVE CAMPAIGN

(Twelve thousand dollars have been raised in California from the central stations, the manufacturers, the jobbers, and the electrical contractor-dealers, to forward a co-operative campaign among all branches of the industry. This campaign heralds the founding of an institution that is unique in the annals of the nation. The effective results that are bound to be brought about from its co-ordinated work will again undoubtedly carry Eastward a new idea in helpfulness that will place the West upon a pinnacle of even still greater leadership in all things good and wholesome for the upuilding of matters electrical.—The Editor.)

Los Angeles witnessed on the evening of March 15, 1918, at Christopher's Cafe, a gathering of three hundred men—perhaps the most representative grouping of men from all branches of the electrical industry intent upon the establishing of a harmonious, workable relationship, ever assembled under one roof. The occasion was the first public launching of the California Electrical Co-operative Campaign described in full detail in the Journal of Electricity, January 15, 1918, page 84. S. M. Kennedy, general agent of the Southern California Edison Company, acted as the genial toastmaster of the occasion, and by putting across a series of cleverly conceived stunts, kept those at the banquet in a continual state of good nature throughout the evening. His witty injection of the word "synergism"—the religion of co-operation—also shows the broad general characteristics of the leader of the evening.

The following program was rendered:

Willis H. Booth.....Reciprocation
Chairman of the Board, Edison Electric Appliance Co.

W. D'Arcy Ryan.....Electrification
Illuminating Engineer, General Electric Co.

L. H. Newbert.....Co-ordination
Chairman Advisory Committee, California Electrical Co-operative Campaign

G. E. Arbogast.....Affiliation
President, Southern California Electrical Contractors and Dealers

Robert Sibley.....Unification
Editor, Journal of Electricity

D. J. Butts.....Co-operation
Manager, Western Electric Co.

Albert H. Elliot.....Synergism
Attorney-at-Law

B. F. Pearson.....Synchronism
Superintendent, Southern Division, Southern California Edison Co.

Two of the excellent papers delivered at the meeting are herewith published in full. The terse points brought out in these two papers are characteristic of all the able talks that were presented. Among the other speakers the clear presentation of the purposes of the Electrical Co-operative Campaign by L. H. Newbert, and the limits and forceful differentiation of the several fields of activity of manufacturer, jobber, contractor-dealer and power company as brought out by Albert H. Elliot, deserve especial mention.

Summarizing the meeting as a whole, perhaps the words of Rudyard Kipling can best be used to describe the conclusions carried away by those present when formulating in mind the necessary interlinking for true co-operation, when he said:

"It ain't the guns, nor armaments, nor the funds that they can pay,
But the close co-operation that makes them win the day.
It ain't the individual nor the army, as a whole,
But the everlasting team work of every bloomin' soul."

AFFILIATION

BY G. E. ARBOGAST

The greatest error evidenced in the electrical contractor field today, is the lack of appreciation of the importance of taking advantage of the opportunities that are before us.

Business men in any trade can no more proceed intelligently without affiliating with some society or organization for the purpose of joint study, mutual education, and united effort, all for the common good, than can an individual firm progress without conferences between members of the firm or heads of departments. Furthermore, it is essential that an industry be composed of factors whose interests can be amalgamated and co-ordinated.

An electrical contractor-dealer cannot afford to be without the helpful ideas and assistance to be derived by mingling with his fellow associates, which can only be gained through affiliation with some organization representing his particular craft, and by thus acquiring the combined impetus resulting from the experience of his fellow workers. Getting together, getting acquainted, and pushing ahead, shoulder to shoulder, is the only way this can be accomplished.

The successful man joins in co-operative efforts with others for the elimination of trade evils and the solution of trade problems. If the business man is suffering from cranial enlargement, he cannot "check up." It is utterly impossible for a man who is suffering from softening of the wits to see failure when he looks in the mirror. As Mencius said, "When men's fowls and dogs are lost, they know how to seek for them again, but they lose their mind and do not know how to seek for it." Like the crazy man who thinks everybody else in the world is crazy, so the man who is satisfied with himself, whose business is different, is satisfied that all the rest of the world is wrong, running after false gods, doing the inefficient thing.

Under present business conditions, community of effort is necessary. If every concern would contribute to the common stock of knowledge, its small investment would more than be returned by what it would get from all sources.

In affiliating with organized effort along co-operative lines, a broader outlook should be uppermost in the mind of the applicant than that of the mere quest of money. It may be said once for all, that no organization can live beyond the exigencies of the hour unless it has an interest above dollars and cents. A de-

Dollars are cheaper than failure.

BUY A LIBERTY BOND

sire to make greater profits may bring men together, but it will not hold them long; the motive is too sordid to encourage any large degree of enthusiasm, and without enthusiasm no movement can go forward. Men, whether in an association or not, should consider certain relations, but when organized, they must consider them. These relations may be outlined as follows:

1. Relations of members to one another.
2. Relations with employees.
3. Relations with those to whom they sell—customers.
4. Relations with those from whom they buy.
5. Relations to the public generally.

Just to the extent these relations are understood and co-ordinated, will the organization justify its existence.

The old method of getting business, which is rapidly falling into discard, was founded on the theory that no one class or individual could profit except at the loss of some other.

The theory of efficiency and conservation now advocates that no class can profit in the long run except as others prosper.

Under the old theory, it was inevitable that each class should organize within itself to gain all it could at the expense of the community.

Under the theory of the new, each class—the manufacturer, jobber, central station, and electrical contractor-dealer—will organize in co-operation with each other to increase the prosperity of the entire community and secure only its fair share of such increased prosperity.

Through the activities of the California Electrical Co-operative Campaign, which has recently been so successfully launched, a great opportunity is presented for expansion of the industry in California. Not only has the manufacturer, jobber and central station an opportunity to increase his business, but the contractor-dealer, last but not least, has the greatest opportunity ever afforded for rendering a real service, first to his country, second to the industry, and third to himself.

CO-OPERATION

BY D. J. BUTTS

The word "co-operation" is derived from the Latin words meaning labor and together, or labors on the same plane. Co-operation is something out of which we all derive some benefit in direct proportion to the energy, effort and enthusiasm we put into it.

"Whether you like it or not," says the New York Mail, in a recent editorial, "you only have to look about you to see that the old way of unlimited competition is passing away in the business world. The first step in this direction in this country is occurring in the distribution of the necessities of life. In every line, co-operation is bound to supplant the competitive agencies that it displaced. Due to engineering skill and the agencies of the steam, gasoline and electric power, production has ceased to be the predominant factor in industrial life, and the competitive system is applied only where there is a market that is over-supplied. The United States has been passing through a period of readjustment from the competitive system to some new form under which our industries may be regulated and prospered."

The Mail further says, as do many others who understand the economic conditions, that this country cannot return to the competitive system.

Co-operation in the larger industries is fairly advanced—take the railroads as an example. Nearly half a million people are the owners of the railroads in the United States. Two million people operate them. These two and a half million people with their families represent one-eighth of the population of the United States.

The same condition exists in the iron and steel industries and the telephone and telegraph industry, and all others where there are a large number of employees.

This large distribution of capital and labor simply means that we must each co-operate in order to save ourselves or some member of our own family commercially.

Co-operation is being enforced by the present administration in various ways. One of the most noticeable and most recent is the work of the Food Administration. It has compelled wholesalers and retailers to co-operate. The administration has fixed the wholesale and retail price and the wholesale and retail distribution policy of the important foods and fuel, and, more than this, has fostered an organization of a policing system to see that the rules of the administration are enforced. This policing would probably be unnecessary if each person interested in the distribution of foods and fuel had a sufficient understanding and knowledge of their own problems. In other words, a broader appreciation of what co-operation means to their own business.

In the electrical industry, this co-operative spirit is expressing itself in this great California movement, of which this meeting is a part. For some time there has been some co-operation within the individual branches of the electrical industry. For instance, the work of the National Electric Light Association, the National Association of Manufacturers, the National Electrical Supply Jobbers Association and the National Electrical Contractors and Dealers Association, but we have now come to the time when all of these interests must work together. In order to make such a large co-operative scheme work out, it will be necessary for each one of us, as individuals, to fit into our place and play our part. This means that each of us must get the Big Idea and be really big men. When I say "big," I mean honest, straightforward business men, with a sense of humor and a knowledge of human nature.

Others will interpret the co-operative efforts as socialistic, or will not be able to get the idea at all. They will simply block the progress. California is especially noted for its excellent roads. These were built and are maintained by co-operation, but did you ever notice how one of these beautiful boulevards may be blocked by one lone, mountain-climbing ass?

There are three precious jewels in business that are being recognized as never before in history and these jewels are: co-operation, mutuality and reciproc-

Make it your victory—

BUY A LIBERTY BOND

ity. You help me and I will help you. Every man who holds a place in our allied industries, whether he be a contractor-dealer, a jobber, a manufacturer or represents a central station, is here by merit or by accident.

It is the degree to which he is able to interpret and practice co-operation that determines his value. If he lacks the vision of future possibilities or the trade necessity of co-operative team work, he is the kind of player that is soon relegated to the bush league.

In working out this California co-operative plan, it is probable there will be some mistakes, but, if each one of us does his individual part well, the plan will be a success and we can console ourselves with the thought expressed by one of our good writers—the people who make mistakes lead the world and the perfect people work for them running errands or counting columns of figures.

Co-operation means treating the other fellow fairly. If you do, no doubt you will get the same treatment from him. It is like the great national baseball game—it must be played by clean, honest players who do not practice slugging or foul tricks.

Co-operation is a vehicle much like a good automobile. Its speed depends upon how hard you step on it, how much power you furnish it. The more thought, hard work and honest endeavor you apply, the faster it goes and the more good or goods you can expect to deliver. It takes team work, not idle talk, to put the thing over. It requires concerted, individual action on the part of each of us. This means a great deal of individual training and a high standard of personal aim. The best expression of this aim is contained in the following copied from the writings of one of our conferees in this room:

"I BELIEVE that progress only means more light. That in the world today electricity leads the van of progress, and is the greatest agent for doing the greatest amount of good to the greater number of people. That in advocating the use of electrical service I am helping to make life more cheerful, hopeful, healthful and useful.

"I BELIEVE that the world does not owe any man a living, but on the contrary, it demands a service of every man, and that the best I can do is the service asked of me.

"I BELIEVE in the efficacy of individual effort, and in the union of individuals, corporations and associations in a common cause, and towards a common end. I believe in the potency of consistent and persistent labor as a trump card in playing the greatest game in the world—Success.

"I BELIEVE in men with spines, not wishbones; in diligence, not laziness; in working, not waiting; in uplifting, not lowering; in boosting, not knocking; in harmony, not discord; in freedom, not friction; and in co-operation, not disintegration.

"I BELIEVE in the broad principle of co-operation because it is constructive, productive and far-reaching in its scope; because it enhances the value of individual effort, broadens usefulness, spreads knowledge, widens vision, increases prospects, decreases difficulties and multiplies opportunities.

"I BELIEVE in the 'generation' of a demand for electricity, the 'transmission' of broad-gage ideas, the 'distribution' of electrical knowledge, the 'transforming' of opposition to friendship, the 'stepping-down' from selfish narrowness, the 'stepping-up' from individual differences; and that each man in himself should be a 'come-along' of enthusiasm, so that the pull may be 'all together, all the time for everything electrical.'"

ATTENDANCE AT CALIFORNIA ELECTRICAL CO-OPERATIVE CAMPAIGN DINNER

L. H. Newbert, Ch. Advisory Committee, Cal. Elec. Co-op. Campaign.
Albert H. Elliot, attorney-at-law and Sec'y Pac. Coast Elec. Sup. Jobbers Ass'n.
W. D'Arcy Ryan, Illuminating Engineer, Gen. Elec. Co.
D. E. Harris, Sales Manager, Pacific States Elec. Co.
Robert Sibley, Editor, Journal of Electricity.
J. W. Redpath, Secretary Cal. Ass'n Elec. Contr's and Dealers.
Willis H. Booth, Ch. of Bd., Edison Electric Appliance Co.
G. E. Arbogast, Pres. So. Cal. Elec. Contr's and Dealers.
H. H. Courtwright, Ch., Fresno Local, Contr's and Dealers.
P. H. Booth, V.-P. and Gen. Sales Mgr. Edison Appliance Co., Ontario (Hotpoint Division).
J. T. Bowden, Salesman, Edison Appliance Co. (Hotpoint Division), Ontario.
R. H. Manahan, City Electrician, Los Angeles.
H. N. Beecher, Chief Elec. Inspector, Los Angeles.
Frank McGinley, Elec. Inspector, Los Angeles.
Chas. Stanton, Elec. Inspector, Los Angeles.
H. G. Holabird, Holabird Electric Co., Los Angeles.
F. M. Coker, Mgr. Coker Elec. Co.
Joseph Neu, Electric Signs.
J. E. Tucker, Mgr. Elec. Prod. Corp.
P. D. Howse, Pres. Elec. Prod. Corp.
W. J. Barman, Garnett Young Co.
R. J. McHugh, Garnett Young Co.
Theo. Burger, Mgr. Baker-Joslyn Co.
W. W. Lane, Salesman, Baker-Joslyn Co.
W. C. Caffrey, Elec. Sales Co.
R. B. Clapp, Manufacturers' Agent.
E. C. Ebert, Manufacturers' Agent.
M. V. Simpson, Manufacturers' Agent.
R. Wolsberg, Electric Agencies Co.
J. L. Kline, Mgr. West. Light & Fix. Co.
E. J. Fleming, Mgr. Anglo Range & Refrig. Co.
J. O. Mills, Secy. Ontario Power Co.
E. B. Criddle, Gen. Agt., Southern Sierras Power Co., Riverside.
J. E. King, Local Supt. Southern Sierras Power Co., San Bernardino.
H. B. Lynch, Mgr. Pub. Serv. Dept., City of Glendale.
F. E. Raymond, Sales Promotion, Pub. Serv. Dept., City of Glendale.
L. E. Moselle, Ch. Clerk to Bus. Agent, Dept. of Pub. Serv., City of Los Angeles.
W. F. Brainerd, Representative, Cal. Elec. Co-op. Campaign.
A. L. Spring Representative, Cal. Elec. Co-op. Campaign.
Henry Holland, Manufacturers' Agent.
J. G. Pomeroy, Manufacturers' Agent.

Southern California Edison Company

S. M. Kennedy, General Agent.
B. F. Pearson, Supt. of So. Div.
W. L. Frost, Asst. Gen. Agent.
A. W. Childs, Supt. of Sales.
G. B. McLean, Asst. Supt. of Sales.
D. M. Trott, Asst. Controller.
J. W. Burns, Indust. Agent.
H. N. Sessions, Com. Engineer.
W. L. Boxall, Power Contract Agent.
C. Peters, Asst. Sec'y.
H. B. Fletcher, Ch. Appliance Salesman.
C. H. Pierson, Advertising Agent.
J. T. Huntington, Dist. Agt., San Pedro.
E. H. Mulligan, Dist. Agent, Pasadena.
A. A. Taylor, Dist. Agent, Pomona.
W. F. Nordholdt, Dist. Agent, Venice.
W. R. Neelands, Dist. Agent, Santa Monica.
W. M. McKnight, Dist. Agent, Redondo.
F. A. Green, Dist. Agent, Long Beach.
Fred Schwartz, Dist. Agent, Monrovia.
C. H. Coulter, Dist. Agent, Van Nuys.
W. A. Wallaber, Dist. Agent, San Bernardino.
A. I. Whitehead, Dist. Agent, Vernon.
W. D. Graef, Dist. Agent, Alhambra.
W. C. McWhinney, Dist. Agent, Lancaster.
N. Hearne, Jr., Dist. Agent, Ventura.
Allan McKenzie, Dist. Agent, Oxnard.
Stanley Lothridge, Dist. Agent, Santa Paula.
R. H. Sterling, Mgr., Santa Barbara Gas & Elec. Co.
R. I. Carruthers, Dist. Agent, Visalia.
A. W. Frost, Ch. Clerk, Alhambra.
A. L. McDonald, Sub-Agt., Hollywood.
Z. L. Sherart, Salesman, Los Angeles.
H. A. Brody, Salesman, Los Angeles.
E. B. Hutchinson, Salesman, Los Angeles.
W. L. Deimling, Dist. Agent, Santa Ana.
P. J. Deninger, Dist. Agent, Whittier.

Los Angeles Gas & Electric Co.

A. B. Day, Gen. Manager.
H. J. Kister, Asst. Gen. Manager.
Frank Weiss, Mgr. New Business.
T. B. Parks, Purchasing Agent.
H. H. Ranlett, Supt. Los Angeles Office.
E. R. Northmore, Supt. Distrib.
F. E. Seaver, Asst. Sec'y.
G. A. Riley, Elec. Inspector.

Contractors and Dealers

R. D. Aylsworth, Aylsworth Elec. Co., Inglewood.
Don Blackmore, Salesman, F. E. Newbery Elec. Co., Los Angeles.
R. C. Bell, Snyder & Bell, San Bernardino.
H. C. Barnard, Salesman, F. E. Newbery Elec. Co., Los Angeles.
J. P. Boring, Orange.
O. J. Crow, Los Angeles.
R. E. Carter, Purch. Agt., Beacon Light Co., Los Angeles.
D. Coldren, Coldren Elec. Co., Riverside.

Men who enlist give both selves and income.

BUY A LIBERTY BOND

ALBERT H. ELLIOT, attorney-at-law, and Secretary for the Pacific Coast Electrical Supply Jobbers Association, was never before more beautifully effective than on this notable occasion in Los Angeles, when he told his audience that co-operation should be carried to such high ideals that it must indeed approach "synergism," or approach the working relationship of the human with the divine mind.

G. E. Capps, Mgr. Sierra Elec. Co., Los Angeles.
J. H. Cannon, Cannon Elec. & Devel. Co., Los Angeles.
C. F. De Baun, Monrovia.
C. Driskell, Salesman, Wilson's Elec. Shop, Los Angeles.
James Ellison, Salesman, Gans Bros., Los Angeles.
R. H. Evans, Los Angeles.
H. C. Folts, Pasadena.
E. J. Fields, Field's Elec. Co., San Bernardino.
Lou Gans, Gans Bros., Los Angeles.
Gus Gans, Gans Bros., Los Angeles.
A. P. Gaylord, Pasadena.
E. H. Granger, Mgr. Granger-Hall Elec. Co., Ontario.
G. P. Gerchens, Puente.
C. F. Green, Mgr. Green's Elec. Store, San Pedro.
G. H. Gillingham, Los Angeles.
C. H. Heilborn, Pres. and Gen. Mgr. So. Elec. Co., San Diego.
C. A. Holland, Los Angeles.
Frank Hoover, Secy. and Treas., H. L. Miller Co., Pasadena.
C. W. Jones, Pres. Pomona Fix. & Wir. Co., Pomona.
J. C. Jacobs, Jacobs Elec. Co., South Pasadena.
Orville Jones, Secy. Bungalow Fix. Co., Los Angeles.
S. F. Jones, Winder & Jones, Covina.
J. King, Store Mgr., So. Cal. Elec. Co., Los Angeles.
L. H. Lang, Los Angeles.
Geo. Legasick, Salesman, Woodill-Hulse Elec. Co., Los Angeles.
G. Loveberg, Los Angeles.
Robert Lloyd, Pres. Foulkes Elec. Co., Los Angeles.
J. H. Lowe, Los Angeles.
J. W. Lane, Lane Elec. Co., Long Beach.
F. O. Lantz, Lantz Elec. Co., Long Beach.
W. L. Le Sage, Estimator, Beacon Light Co., Los Angeles.
S. E. Ledbetter, Salesman, Beacon Light Co., Los Angeles.
Joseph Lieb, Anaheim.
L. L. Leavitt, Store Mgr., Green's Elec. Store, San Pedro.
T. F. Marshall, Hollywood.
M. C. Madison, Los Angeles.
W. A. McNally, W. A. McNally Co., Pasadena.
H. L. Miller, H. L. Miller Co., Pasadena.
F. E. Newbery, Pres. F. E. Newbery Elec. Co.
E. K. Naudain, Mgr. Glendale Elec. Co., Glendale.
J. A. Newton, J. A. Newton Elec. Co., Glendale.
W. C. Nielson, Nielson-Smith Elec. Co., Santa Barbara.
J. J. Prevost, Mgr. Pico Elec. Shop, Los Angeles.
F. B. Potter, Los Angeles.
Theo. Palmer, Palmer's Motor Shop, Santa Ana.
J. C. Rendler, Mgr. So. Cal. Elec. Co., Los Angeles.
C. A. Renard, Renard & Stary Elec. Co., Los Angeles.
P. I. Sutter, Salesman, F. E. Newbery Elec. Co., Los Angeles.
H. G. Stone, Mgr. Elec. Const. Co., Hollywood.
H. A. Snyder, Snyder & Bell, San Bernardino.
N. L. Stary, Renard & Stary Elec. Co., Los Angeles.
F. D. Stevenson, Los Angeles.
Walter Smith, Smith Plumbing & Elec. Co., Van Nuys.
W. M. Stockwell, Mgr. Ventura Elec. Co., Ventura.
Roy Spillsbury, Supt. F. E. Newbery Elec. Co., Los Angeles.
A. S. Tyler, Los Angeles.
H. L. Vonder Kuhlen, Los Angeles.
J. E. Wilson, Wilson's Elec. Shop, Los Angeles.
H. B. Woodill, Pres. Woodill-Hulse Elec. Co., Los Angeles.
R. B. Winder, Winder & Jones, Covina.
Chas. Walsworth, Mgr. San Pedro Elec. Co., San Pedro.
W. P. Whipple, H. L. Miller Co., Pasadena.
G. I. Aiken, Salesman, Beacon Light Co., Los Angeles.
T. H. Few, Secy. and Treas. Foulkes Elec. Co., Los Angeles.
B. R. Hensel, Los Angeles.
G. E. Neefus, Salesman, Beacon Light Co., Los Angeles.
H. N. Snyder, Santa Paula.
T. G. Parker, Secy. and Treas. Golden State Elec. Co., Los Angeles.
R. G. Williams, Store Mgr., Foulkes Elec. Co., Los Angeles.
P. G. Wyman, Salesman, Golden State Elec. Co., Los Angeles.

G. E. ARBOGAST, President Southern California Electrical Contractors and Dealers, in speaking upon affiliation, brought out ideals of a working relationship well worthy the consideration of all thoughtful men. His words are printed in full elsewhere in this issue of the Journal of Electricity.

General Electric Company

J. O. Case, Loc. Mgr. Sup. Dept.
C. M. Bliven, Loc. Mgr. Appar. Dept.
C. E. Spaulding, Sales Manager, Edison Lamp Works.
E. E. Valk, Loc. Engineer.
S. E. Kearney, Loc. Auditor.
H. W. Wood, Cashier.
A. W. Arlin, Railway Salesman.
C. T. Carr, Salesman.
S. G. Gassaway, Salesman.
J. H. Cunningham, Salesman.
E. M. Ellis, Salesman.
E. L. Nightingale, Salesman.
A. Bachrach, Price Clerk.
C. E. Cayot, Office Salesman.

Westinghouse Electric and Manufacturing Company

P. M. Lincoln, Consulting Engineer, East Pittsburgh, Pa.
H. D. Stephens, Special Sales Repres., East Pittsburgh, Pa.
K. E. Van Kuren, District Manager.
G. O. Noble, Mgr. Pow. Div.
C. D. Lamoree, Mgr. Sup. Div.
J. H. Fenton, Mgr. Indust. Div.
C. T. Yarbrough, Supt. Serv. Dept.
L. P. Lee, Treasurer.
L. W. Davis, Mgr. West. Lamp Co.
R. A. Hopkins, Sales Representative.
J. H. Jamison, Sales Representative.
C. D. Kunkel, Sales Representative.
J. M. Morris, Sales Representative.
H. H. Fogwell, Sales Representative.
N. W. Sherman, Sales Representative.
F. E. Anderson, Sales Representative.
H. C. Paulin, Sales Representative.
H. O'Brien, Sales Representative.
H. C. Thornburg, Salesman West. Lamp Co.
J. A. Payton, Service Department.

Pacific States Electric Company

F. J. Airey, Dist. Mgr.
H. C. Chapman, Asst. Treas.
F. B. Nightingale, Appliance Specialist.
A. E. Rimpau, Lamp Specialist.
C. E. Spott, Illuminating Specialist.
R. W. Hunting, Salesman.
W. R. Edwards, Salesman.
C. H. Pendleton, Salesman.
W. H. Sexton, Salesman.
R. C. Herb, Salesman.

Western Electric Company

D. J. Butts, Manager.
O. S. Lair, Stores Manager.
W. F. Gibbs, Asst. Treasurer.
A. B. Vandercook, Telephone Specialist.
O. S. Strain, Household Specialist.
L. W. Drake, Salesman.
L. E. Darrow, Salesman.
J. G. Loomer, Salesman.
F. M. Baum, Salesman.

Illinois Electric Company

C. B. Hall, General Manager.
D. C. Pence, Sales Manager.
S. W. Murray, Asst. Secy. and Treas.
Stanley Searle, Salesman.
G. A. Vetter, Salesman.
A. H. Reese, Salesman.
E. B. Pinson, Salesman.
J. A. Paulsen, Purchasing Agent.
J. F. Adis, Order Clerk.

Graham-Reynolds Electric Company

N. W. Graham, Pres. and Gen. Mgr.
D. L. Reynolds, Secy. and Treas.
H. W. Allen, Salesman.
Allen Smith, Salesman.
E. E. Russell, Salesman.
P. C. Ensley, Salesman.

Electric Corporation

A. R. Fierce, President.
Ross Hartley, Vice-President.
C. F. Fisher, Salesman.
W. S. Sweet, Salesman.

Listenwalter & Gough

P. G. Gough, President.
C. E. Listenwalter, Secy.-Treas.
O. G. Thorp, Salesman.
S. G. Nolton, Salesman.
Ward Listenwalter, Stock Clerk.

J. A. Roebling's Sons Co.

J. N. Colkitt, Sales Agent.
J. H. Alexander, Office Salesman.
Geo. Cedarlof, Price Clerk.
Thos. D. McKeever, Salesman.
Harry F. Folson, Salesman.
W. G. Marks, Salesman.
L. Kimball, Stock Clerk.

United States Steel Products Corporation

R. B. Rawls, Sales Agent.
D. W. Smith, Sales Agent.
B. B. Bevier, Asst. Cashier.
D. P. Leach, Salesman.

B. F. PEARSON, superintendent of the Southern Division, Southern California Edison Company, affectionately known by all as "Uncle Ben," stirred his audience to their depths when he described his ideals of the point of contact that must be maintained between a man and his workers, and the consequent necessity of always putting into practice the principles of the Golden Rule.

You must face the boys when they return.

BUY A LIBERTY BOND

POWER RESOURCES IN SOUTHERN CALIFORNIA

BY H. A. BARRE

(The power companies of Southern California are meeting the war demand for increased output. Immediate results are being obtained so far as possible by interconnection and a comprehensive program for future power development from hydraulic sources has been laid out. This thoughtful survey by a man who is electrical and mechanical engineer with the Southern California Edison Company, is part of the war program which is being presented by the Engineering Committee for the war service convention of the Pacific Coast Section, N. E. L. A., to be held next month at Del Monte.—The Editor.)

When the Railroad Commission called upon the power companies of California to consider what conservation of fuel could be made by inter-connection of systems and co-operative use of plants, the power companies were suddenly compelled to view their problem from a new and startling standpoint.

Previously each company was so busy with its particular kind of effort to keep just a little ahead of trouble, that the attention given to the study of the problems affecting the whole industry had been more or less restricted to matters of detail.

The moment that the necessities of the country caused the companies to think, first, of the means by which these necessities could be provided for, and, secondarily, of the manner in which their individual interests would be involved, some most impressive aspects of the conditions generally affecting the industry demanded the attention of every one.

It became realized that the power industry was a war necessity of the first magnitude, and that in California particularly, in addition to the demands on it for power for manufacturing war materials, it must accept the responsibility for providing power for irrigation, and the almost equally great responsibility for the greatest possible conservation of fuel oil.

It was next seen that in order to meet the demands upon them, the power companies of Northern California must provide an annual increase of generating capacity of 25,000 to 30,000 kw., and of Southern California about 25,000 kw., a total of not less than 50,000 kw. per year. In addition to this amount of generating capacity, corresponding increases in transmission and distribution plant must be made.

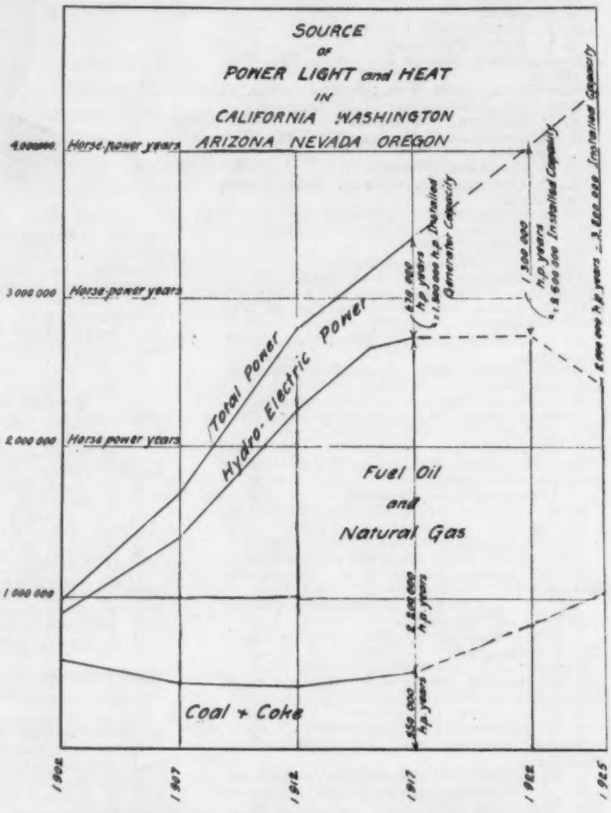
In attempting to determine the money necessary to carry out such a program of growth, it was found that when the source of power is water power, the expenditure for generation, transmission and distribution would be approximately $8 per year for each dollar of increase of revenue.

Since the revenues of the companies of California increase from $2,000,000 to $2,500,000 per year, this means $16,000,000 to $20,000,000 new capital per year to be provided, at least for the duration of the war. The duration of the war may be from twenty days to twenty years, but when the United States Government is seen making preparations for a period of three to five years, it would appear good judgment to follow its lead and make preparations for not less than three years.

This in turn means a financial program involving $50,000,000 to $60,000,000, exclusive of necessities for refunding maturing obligations and for taking care of existing requirements.

The companies further face the necessity of meeting the foregoing conditions at a time of national catastrophe, when all available material, men, money, and all other human activities have been commandeered by the government and gladly given over to it.

The one certainty in the whole matter is that the requirements and responsibilities will be met. If the peace time machinery for providing materials and money has become inoperative, new machinery must be provided and the necessities taken care of.



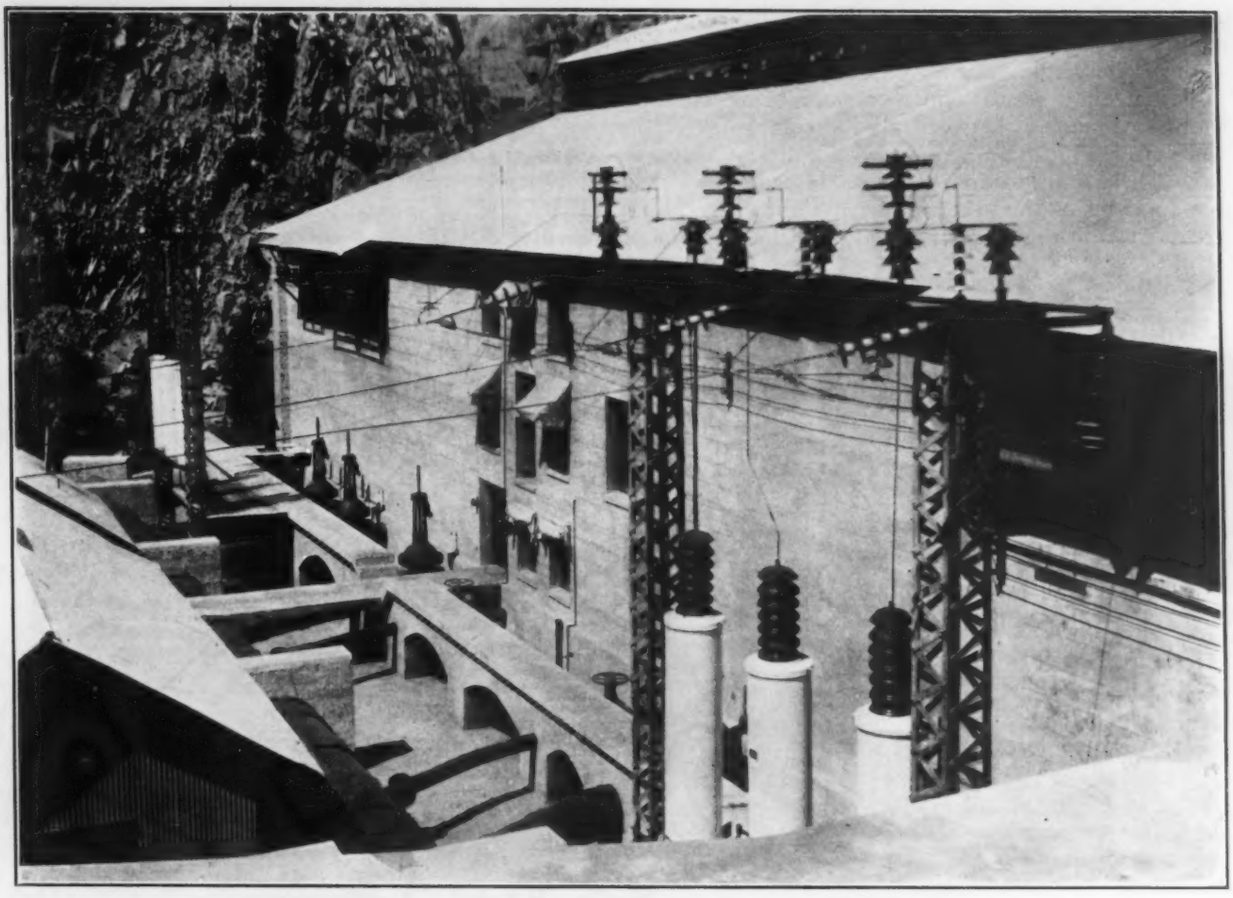
THE DEMAND WHICH MUST BE MET

A chart worked out by D. M. Folsom, Pacific Coast Fuel Oil Administrator, which shows that in seven years' time the installed capacity in hydro-electric power must be more than doubled to meet the demand in California, Washington, Arizona, Nevada and Oregon.

Since most of what we do for the period of the war must remain with us afterward, care should be taken to see that the developments made should be those parts of the possible developments of the state which will be permanent acquisitions, and at the same time give the most power in the quickest time for the least money.

Why should we ask the other man to pay the debt?

BUY A LIBERTY BOND



KERN RIVER PLANT, SOUTHERN CALIFORNIA EDISON COMPANY

The Southern California Edison Company is planning extensions to its Kern River Plant No. 3 in the near future—and has made improvements which increase the efficiency of the Kern River Plant No. 1.

It is apparent that the first and greatest need of the power companies is more power, and that the need for conservation of fuel oil determines that this power must come from hydro-electric developments.

Some developments in Southern California now under way can be completed in the time necessary to obtain and install the necessary pipe lines and machinery which will make them available during 1919. Some other developments have progressed to the point where the engineering has been practically completed, and construction can be begun quickly, but the time required for completion will be longer. Others are in the preliminary stage and considerable time will be necessary for investigation, clearing of titles, permits and similar preliminaries before construction can be begun.

In other words, plants of the first class, like the Los Angeles Aqueduct's San Francisquito No. 2 plant, can be ready in twelve to fifteen months; extensions of the San Joaquin Light & Power Corporation's Kern canyon 20,000 kw. plant in about the same time; the Southern California Edison Company's Kern No. 3, 30,000 kw. plant, and an additional unit of 16,000 kw. in its Big Creek No. 2 plant, can be made in fifteen to eighteen months.

Of the second class, Southern California Edison Company's Big Creek No. 3 plant, 34,000 kw., is one of those on which immediate construction can begin, although the time to complete it would be twenty-four to thirty months.

The Southern Sierras Power Company, San Joaquin Light & Power Corporation, and Southern California Edison Company all have in mind other developments, more or less advanced, which can be utilized within the three-year period for meeting the state's needs.

In the territory served by the companies listed opportunity exists for the development of hydro-electric power in the next three years, as shown in table 1, following:

TABLE 1

	K.W.H. per Year.	Equivalent Barrels of Oil
1—The most immediate of these is the possibility of installing certain plants on the Los Angeles Aqueduct which are partly developed and which could be ready by 1919, capable of supplying	100,000,000	500,000
2—Edison Company has a program of development on Kern River and Big Creek for completion in 1919-20 and '21, which can supply	400,000,000	2,000,000
3—San Joaquin can construct plants on the San Joaquin and Kings Rivers, which can supply	200,000,000	1,000,000
4—Southern Sierras can complete plants to supply	150,000,000	750,000
Total	850,000,000	4,250,000
The total estimated cost of the proposed developments is approximately	$30,000,000	

What would you pay that we might win the war?

BUY A LIBERTY BOND

It will be seen that these permanent developments begin to have an effect on the situation, commencing at the earliest in about twelve months.

Immediate results, however, are being obtained by interconnection between all the companies of the Southern San Joaquin Valley and Southern California, although limitations and decreases in economy occur, due to the fact that the Southern California Edison Company, and the municipal plants of the city of Los Angeles, operate at 50 cycles and the others at 60 cycles.

Some of the connections between the 50 and 60 cycle systems are made by means of frequency changers previously purchased, and at other points the speeds of generators are being changed from time to time to conform to the frequency of the system being supplied.

The companies affected are given in table 2.

TABLE 2

Southern California Edison Company.
Los Angeles Gas & Electric Company.
Los Angeles Aqueduct.
San Joaquin Light & Power Corporation.
Mt. Whitney Power & Electric Company.
Southern Sierras Power Company.
San Diego Gas & Electric Company.

The net results of these interconnections in a year of normal water supply would be the conservation of power amounting to 112,000,000 kwh., which, together with other measures and economies, is equivalent to a saving of 781,000 barrels of oil, although on account of the present dry year and the fact that all the arrangements will not be in operation for a full year, the full benefit will not be obtained in 1918.

A study has been made of the diversity existing between the loads of the various Southern California companies. For the year 1917 a total diversity of 15,000 kw. was found to exist out of a maximum peak load of 238,000 kw. This in itself is worth to the co-

THE POWER LINES OF SOUTHERN CALIFORNIA

The map gives an idea to the reader of the general relation of power lines in the southern portion of California with the possibilities of interconnection and further development. The extreme long distances which must be spanned, as well as the agricultural character of the country served, have much to do in determining the exact nature of the problems to be met.

operating companies not less than $1,000,000 when arrangements can be completed to take full advantage of it.

The high prices of equipment and money make necessary a revision of standards of service in order that the permanent burden on both the companies and the public may be as light as possible. We have willingly agreed to restrictions in our food supply, our railway service, and of our liberties in various ways, so that it is in order to get along without those refinements for continuity of service and close regulation to which we had become accustomed. We should furnish service good enough to do the job, but it is more important that 100,000 people have service 97 per cent of the time than that 50,000 people have it 99 per cent of the time, or 30,000 people 100 per cent of the time.

Generally speaking, the service of the California companies, even in peace time, has been of a particularly high grade. The same amount of money would have served a larger territory and more people with a very slight reduction in service standards. Conversely, consumers requiring a higher standard of service should pay higher rates.

What has it meant to you to live in the United States?

BUY A LIBERTY BOND

STANDARDIZATION OF PIN TYPE INSULATORS

BY L. M. KLAUBER AND R. E. CUNNINGHAM

(With the idea of reducing duplication in manufacturers' stocks, now necessary owing to the variety of practice in the use of insulators by the various distributing companies, and in consequence reducing costs and improving service, this committee was appointed to consider possibilities of the standardization of such supplies. The result of their investigations is here presented as a portion of the Engineering Committee's report to the coming Pacific Coast Section N. E. L. A. convention. The recommendations offered cover the ground most comprehensively, and form the basis for important action on the part of the association. The authors hold high positions with the engineering staffs of the San Diego Consolidated Gas & Electric Company and the Southern California Edison Company, respectively.—The Editor.)

Scope

This report covers the standardization of pin type insulators and pins for distribution circuits. This subcommittee was appointed with the idea that if standards could be agreed upon not only would manufacturers' stocks on the Pacific Coast be reduced but the standard types adopted would be more readily obtainable and at reasonable prices.

Necessarily, for commercial reasons, our recommendations must have to do with types, specifications and ratings rather than with brands and particular style numbers. However, we propose to be sufficiently specific so that if our recommendations be approved each manufacturer need provide but a single style for each voltage and class of service, and as we have further handled voltages by groups, the total number of styles required is materially limited. In addition, we have divided classes of service into two divisions based on severity of operating conditions and for each of the voltage groups under moderate conditions, we have recommended the same styles as those suggested for the next lower voltage group under severe conditions. We have been able to make our recommendations as to insulator types fairly restrictive without favoring any particular manufacturer, since all appear to put out essentially parallel lines; pins, however, are not nearly so well standardized, as several manufacturers fabricate unique types.

The term distribution is an elastic one, especially on the Pacific Coast, where our sparsely settled agricultural and mining districts require distribution lines of great extent, which in some cases assume the characteristics of transmission lines. But while some of our member companies operate purely distribution lines at 33 kv. and even higher pressures, it has been deemed advisable to limit this report to lines of 22 kv. or less, since at the higher voltages the special conditions of each case limit the possibilities of standardization.

Data Accumulated

Early in October, 1917, your committee sent out to our various member companies a questionnaire covering the investigation at hand. Complete responses have been received from thirteen companies and partial data from several more. The replies detailed first, second and third choices of insulators and pins for each voltage used, with remarks as to special operating conditions tending to affect the choice of type.

Operating Conditions

As may be expected, practice varies widely amongst the various companies. Some of this variation is due to climatic and other differences in operating conditions and these must of course be allowed for in any scheme of standardization. Other differences, however, are merely due to lack of knowledge of what other companies are doing, and these variations it may be possible to eliminate with the co-operation of our engineering committee.

It is well known that the peculiar climatic conditions on the Pacific Coast and the wide variations in temperature, rainfall, fog, etc., met with in closely contiguous territories, require different standards for lines of similar voltage in different territories. In general, it may be said that the coast or fog belt conditions are particularly severe. Here the long rainless summer, during which the insulator becomes coated with salt and dust, and is simultaneously subjected to the moisture of fog and spray, produces a condition far more serious than the heat and dry dust of the interior valleys or the snow and sleet to which the mountain lines are subjected. So we find that nearly all companies whose lines cover both coast and interior valleys have at least two sets of specifications, one for the severe coast and the other for interior service. In line with this necessary practice, your committee has recommended separate standards for coast and interior service on lines of similar voltage.

No sharp line can be drawn in any territory to indicate where the use of the coast insulator should begin. Some companies segragate their districts by arbitrary boundaries drawn a certain distance from the coast; others learn from experience just how far inland the heavy insulators are required. In general, three to five miles appears to be the limit. High cliffs along the ocean shore which prevent spray from being blown inland bring the limit closer to the shore; on the other hand, salt marshes and sloughs carry the line further inland.

Voltage Classes

Within the voltage limits above prescribed, we find that standardization of voltages has so far progressed in our district that grouping is comparatively easy. The great bulk of the mileage operated falls within one of the following classes: (1) 2300-4000 Y, (2) 11,000, or (3) 22,000.

In addition, there are some lines operating at 6600, 13,200 and 15,000 volts. For the purposes of this report, it has appeared advisable to assign a separate 6600 volt class and to group the 13,200 and 15,000 volt lines with the 11 kv. class. This appears particularly

Measure up your sacrifice with theirs—

BUY A LIBERTY BOND

advisable since the largest 15 kv. net work is operated by a company having an extensive 11 kv. system.

2300 Volts Delta—4000 Y—Interior Districts

Although a number of companies operating in the interior use porcelain insulators for this service, the bulk of the insulators sold in this territory for 2300 volt service appear to be D G D P glass. Porcelain unquestionably has advantages in strength and durability, yet the low price and ease in obtaining the glass insulator render its adoption advisable. Wires of 1/0 or larger are not well adapted to the D G D P insulator, and it is recommended that one of the standard cable glass insulators be adopted for this service.

2300 Volts Delta—4000 Y—Coast Districts

Some companies apparently experience no difficulty with D G D P glass insulators under coast conditions; others, where fogs are more severe, find these inadequate. It is recommended that where this is found to be the case the one-piece porcelain insulator recommended for 6600 volt interior service be used.

6600 Volts—Interior Districts

Few companies are now operating at this voltage in our territory and reports were received from only two. We recommend for this service a one-piece two-petticoat porcelain top-groove insulator with one-inch pin hole. The diameter should be about 3¾ inches, the height 3 inches, and the leakage approximately 5½ inches. Such insulators are ordinarily rated by the manufacturers at from 6600 to 8000 volts. Insulators which fulfill this specification, selected from catalogs of four prominent manufacturers, are detailed as follows:

TABLE NO. 1

Typical Insulators for 6600 Volt Service in Interior Districts

Manufacturer.	A	B	C	D
Line voltage	8,000	6,600	6,600	7,500
Dry arcing voltage	60,000	.....	55,000	55,000
Wet arcing voltage	32,000	.....	23,000	24,000
Leakage distance	5⅝	5¼	5½	5½
Diameter	3¾	3¾	3⅞	3¾
Height	3	3	3	3

Note: Distances are measured in inches.

6600 Volts—Coast Districts

We recommend that in these districts the insulators specified for 11 kv. interior districts be used.

11,000, 13,200, 15,000 Volts—Interior Districts

Many of the companies in this territory operate 11 kv. lines as their high voltage distribution circuits and but few at 13 or 15 kv. It would seem advisable to choose one type of insulator for these several voltages. If these be found insufficient for 15,000 volt service, it is recommended that the type suggested for 11 kv. coast service be used.

Nowhere is the desirability of specifying different types of insulators for service on the coast and in the interior better evidenced than in the reports received from companies operating at 11 kv. In almost all cases those which operate only in the interior specify styles which experience has proved to be entirely inadequate to coast service, and those which operate in both classes of territory, with one exception, specify separate types for each condition. We recommend for interior districts a one-piece two-petticoat porcelain top groove insulator with one-inch pin hole. The diameter should be about 5½ inches, the height 3½ inches, and the leakage distance at least 7 inches. This is a small and relatively cheap insulator with the desirable strength and durability of a one-piece unit, yet with adequate electric qualities.

TABLE NO. 2

Typical Insulators for 11 kv. Service in Interior Districts:

Manufacturer.	A	C	D
Line voltage	15,000	15,000	13,500
Dry arcing voltage	80,000	82,000	65,000
Wet arcing voltage	50,000	43,000	28,000
Leakage distance	7	8	7¼
Diameter	5½	6½	5½
Height	3½	4	3½

Note: Distances are measured in inches.

A few companies have used with great success on 6600 volt lines in moderately severe districts, and on 11 kv. lines in especially favorable districts, an insulator somewhat smaller than that above recommended. Owing to the great savings effected by the employment of this design, it is recommended that its use be continued (although it is not here incorporated as a standard) in districts where it is of proved adequacy. This insulator has the following characteristics:

Line voltage	11,000
Dry arcing voltage	40,000
Leakage distance	7½"
Diameter	4⅝"
Height	4⅛"

11,000, 13,200, 15,000 Volts—Coast Service

All companies operating 11 kv. lines along the coast, and this includes all of the largest operating companies in this territory, report the use of insulators rated by the manufacturers at 27 kv. for this service. Five companies report the use of what may be termed a "standard" type; two companies report the use of a "higher efficiency" type, with the standard type second choice. This is the lowest voltage at which the modern higher efficiency type is met. In view of the strong recommendation which these insulators are given by the manufacturers, their obvious mechanical advantages and the fact that but two out of seven companies have adopted them as standards, it would appear advisable to present at this point a general

TABLE NO. 3

Typical Standard Designs. 27 kv. Service (Manufacturers' Rating)

Manufacturer.	A	B	C	D
Line voltage	28,000	27,000	27,500	27,000
Dry arc over voltage	85,000	80,000	98,000	85,000
Wet arc over voltage	65,000	.....	68,000	57,000
Leakage distance	11¼	13	13¾	14½
Wet arcing distance	....	3½	4¼	4¾
Minimum height of pin	7	7	8	8
Size pin hole	1⅜	1⅜	1⅜	1⅜
Net weight	4	4 2/3	6 1/3	4⅝
Diameter top shell	8	7½	7¼	8
Diameter bottom shell	5¼	4½	4¼	3¾
Height	6¾	6¾	7	6¾

Note: Distances are measured in inches.

TABLE NO 4

Typical Higher Efficiency Designs. 27 kv. Service (Manufacturers' Rating)

Manufacturer.	A	B	C	D
Line voltage	27,000	27,000	*25,000	*22,000
Dry arc over voltage	105,000	100,000	89,000	84,000
Wet arc over voltage	65,000	.....	54,000	44,000
Leakage Distance	10½	11⅞	12	12
Wet arcing distance	....	4⅝	5	4⅝
Minimum height of pin	5	6	5¾	5½
Size pin hole	1⅜	1⅜	1⅜	1⅜
Net weight	6¾	6¼	6½	5¾
Diameter top shell	7½	7½	7½	7½
Diameter bottom shell	6	5½	5½	5½
Height	5⅛	5¼	5¼	5¼

*Not rated at 27 kv. but directly comparable in dimensions with those so rated.

Note: Distances are measured in inches.

And you are not even asked to give—only lend—

BUY A LIBERTY BOND

TABLE NO. 5

Comparison Between 27 kv. Insulators of Standard and Higher Efficiency Types

	Standard.	Higher Efficieny
Line voltage	27,000	27,000
Dry arc over voltage	87,000	95,000
Wet arc over voltage	63,000	54,000
Leakage distance	13½	11½
Wet arcing distance	4¼	4½
Minimum height of pin	7½	5½
Size of pin hole	1⅜	1⅜
Net weight	4 2/3	6¼
Diameter top shell	7¾	7½
Diameter bottom shell	4½	5½
Height	6¾	5¼

Note: Distances are measured in inches.

TABLE NO. 6

Typical Designs Recommended for 22 kv. Service, Coast Districts

Manufacturer.	A	B	C	D
Line voltage	45,000	45,000	40,000	40,000
Dry arc over voltage	150,000	145,000	131,000	114,000
Wet arc over voltage	90,000	.....	81,000	76,000
Leakage distance	20	21¼	21½	21
Wet arcing distance	..	7	7	6½
Minimum height of pin	7	7½	7¾	7
Size of pin hole	1⅜	1⅜	1⅜	1⅜
Net weight	13½	11	18	10
Diameter of top shell	11	10½	11	10½
Diameter of bottom shell	7½	7½	*8½	7⅜
Height	7	7	6⅝	6¾

*Second shell—this insulator has three parts.
Note: Distances are measured in inches.

comparison between the "standard" and "higher efficiency" types and to examine into the relative merits of these two types. We have tabulated first the standard types for 27 kv. service of four manufacturers; then the higher efficiency type. From each table we have then taken the salient points of the two types and compared them in a third table; a diagram is likewise presented to show the general appearance of the two types.

From the above tables we deduce a comparison using composite rather than average values for each type.

made particularly to solve the problems of our severe coast conditions, and the success of these designs has been proved in the experience of several of our member companies operating along the coast. For further discussion of the relative values of these types our members are referred to the article by Mr. A. O. Austin, entitled "Factors Affecting Selection of Insulators," Electrical World, Volume 70, No. 19, Page 905, and the paper by the same author read before the Toronto Section of the A. I. E. E., and obtainable through the courtesy of the Ohio Brass Company.

Your committee recommends, therefore, for use on 11 kv lines, under coast conditions, a 27 kv. insu-

TABLE NO. 7

Summary of Insulator Recommendations

No. of Class	Character of Service	Type of Insulator	Material	Leakage Distance*	Wet Arcing Distance*	Pin Hole	Diameter*	Height*
1	2300 volts del. 4000 volts Y Ordinary conditions.	DPDG	Glass	4¼	1¼	1"	3¼"	4"
2	6.6 kv. Interior Districts. 2300-4000 v. specially severe service.	One Piece	Porcelain	5½	1½	1"	3¾"	3"
3	11 kv. / 13.2 kv. / 15 kv. Interior Dists. 6.6 kv. Coast Districts	One Piece	Porcelain	7	2½	1"	5½"	3½"
4	22 kv. Interior Districts 11-15 kv. Coast Districts	Higher Efficiency	Porcelain	11½	4½	1⅜"	7½"	5¼"
5	22 kv. Coast Districts	Higher Efficiency	Porcelain	21	7	1⅜"	11"	7"

Note: Distances are measured in inches.
*Designs of different manufacturers vary slightly in these dimensions.

Of course, as operators, we are interested not so much in design as in the practical results of that design. It is not within the province of this report to discuss the technical features of the design of these so-called higher efficiency units; our purpose in presenting the above tables is to show, first, that several of the more important manufacturers are now putting out insulators of this type and, secondly, to make clear to our members by the last table the structural differences between composite examples of these types. In general it can be said that mechanically the modern small, heavy insulator is to be preferred in every way. The thick shell gives it greater mechanical strength, less liability to breakage in transit, greater resistance to cyclic temperature changes, affords a smaller target to incipient sharpshooters, and, as it requires a shorter pin, results in a cheaper and stronger pin installation. As to the comparative electrical properties of these types, a discussion of these is beyond this report. Suffice it to say that the newer designs were originally lator of the higher efficiency type following closely the design outlined in the right-hand column of Table No. 5.

22 Kv.—Interior Districts

The 27 kv. insulator adopted above for 11 kv. coast districts is recommended.

22 Kv.—Coast Service

A 45 kv. higher efficiency insulator is recommended. Typical products of various manufacturers are shown in Table No. 6.

Selection of Pins

Having selected insulator standards, the selection of pins becomes much simplified, since pin dimensions

To rid the world of war—

BUY A LIBERTY BOND

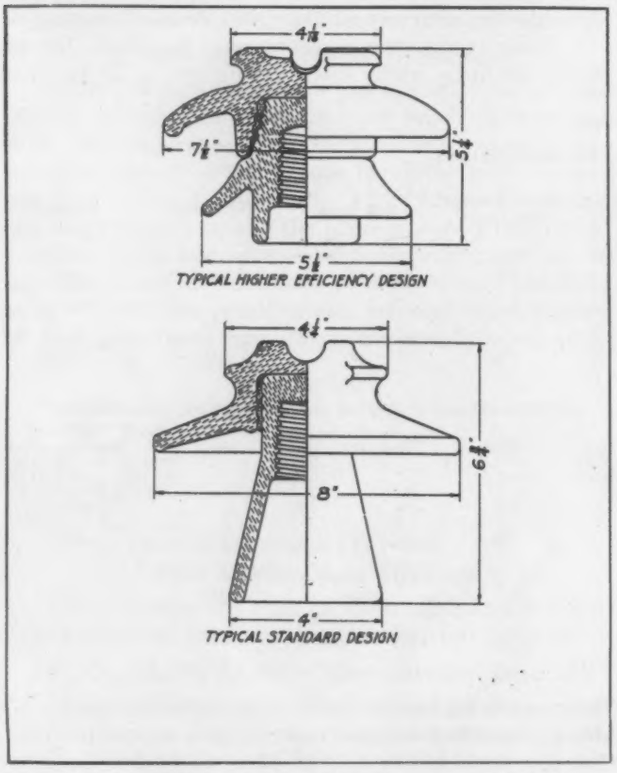
are largely determined by the insulator characteristics. The types of pins to be considered are as follows:

Type No.	Construction—
1.	All wood.
2.	Steel bolt, iron base, wood thimble.
3.	Steel bolt, iron or steel (pipe) base, lead thimble.
4.	Steel bolt, iron or steel base, C. I. cemented in thimble.
5.	Steel bolt, porcelain base, wood thimble.
6.	Steel bolt, porcelain base, lead thimble.
7.	Steel bolt, one-piece wood base and thimble.
8.	Forged one-piece steel bolt and base, spring thimble.
9.	Forged one-piece steel bolt and base, drawn steel cemented in thimble.
10.	Forged one-piece steel bolt and base, lead thimble.
11.	Forged one-piece steel bolt and base, wood thimble.
12.	Separable steel bolt and one-piece malleable iron top complete with split thimble.*
13.	Separable steel bolt, malleable iron base and malleable iron cemented in thimble.
14.	Malleable iron one-piece pin with split thimble.*
15.	Malleable iron one-piece bolt and base with malleable iron cemented in thimble.

*With or without felt insertion.

Discussion of Types

Cement is the bugbear in all insulator work. It is under serious suspicion in suspension insulator construction, and it has been proven that the less used in pin type insulators the better. To cement in an insulator thimble is adding questionable material to the device, and furthermore a standardized screw socket which will fit a variety of pins is at once converted into a special socket which will usually fit but one brand. Your committee advises against the use of any pin engaging a cemented-in thimble. This eliminates types 4, 9, 13 and 15.



Typical insulator designs—dimensions are indicated

The all wood pin especially for insulators having one-inch pin holes has the advantages of low first cost, reasonable strength, and is unaffected by cyclic temperature changes. With few exceptions, all of our member companies use this pin in 2300-4000 volt service, although several of those which employ porcelain insulators in such work likewise use combination pins. We recommend that the standard 9-inch N. E. L. A. pin be used with class 1 insulators. N. E. L. A. specifications should be used in making purchases, except that as locust is becoming increasingly difficult to obtain, and eucalyptus is produced on this coast and has been used with success by many of our members, it is recommended as a substitute. Sufficient data is not on hand with respect to ohia, birch, oak and other woods proposed, and we withhold recommendation of these.

All dependence for insulation should be placed on insulators, not on pins. A pin is primarily a mechanical support and to design it to act as a subsidiary insulator must invariably weaken its mechanical strength. While wood thimbles are satisfactory from the point of view of relieving insulators of stresses due to cyclic temperature changes, their performance is distinctly unsatisfactory whenever they are subjected to appreciable charging or leakage currents. This inevitably results in a digesting or charring of the wood and failure of the pin to properly hold the insulator. This condition is exaggerated in pins having steel bolts and wood thimbles, owing probably to the concentration of the electrostatic stress on a comparatively thin shell of wood. This experience has been universal amongst our member companies and need not be further commented upon. In view of the above, we recommend against the use of all wood pins, except with class 1 insulators, and against the use of combination pins containing wood for any service. Should pins of this type be returned from the lines, and it is desired to re-install them, we recommend that wood thimbles be replaced with lead. Several of our members now follow this procedure with success. The elimination of wood thimbles cuts out types 2, 5, 7 and 11.

The proposition that dependence for insulation should be placed entirely on the insulators above eliminates pins having porcelain parts. These have a high percentage of breakage and lack strength. They may be used with lead thimbles on light lines when second hand, but should no longer be purchased. This eliminates type 6.

Types 3, 8, 10, 12 and 14, being all metal devices, will give adequate service. Of these types, 8 and 14 lack the strength of the others and are not recommended for insulators having 1⅜-inch pin holes, although their low first cost is distinctively attractive for class 2 and 3 insulators. Type 12, while more expensive than the other two, has the great advantage of a separable stud bolt which permits the use of the same head on wood or steel cross arms of any dimensions. After due consideration of these facts, we recommend for class 2 and 3 insulators a pin of types 8, 12 or 14, and of the following general dimensions:

Diameter of bolt	⅝"
Length of bolt (for 4½" crossarm)	5½-6"
(Vary as desired for other crossarms.)	
Height above shoulder	4½-5"

All metal parts should be galvanized according to N. E. L. A. specification. For pins with split thimbles felt insertion is preferred.

For class 4 and 5 insulators, type 8 and 14 pins

This is history—have a share in it.

BUY A LIBERTY BOND

TABLE No 8

Summary of Pin Recommendations

Class of Insulator	Character of Service	Type of Pin All Metal Parts to be NELA Galv.	Size of Thread	Height above Arm	Diameter of Base	Size of Bolt	Length of Bolt
1	2300 volts Delta 4000 volts Y Ordinary conditions	Wood, Locust or Eucalyptus	1″	5″	1¾″	1½″	4″
2	6.6 kv. Interior Districts 2300-4000 Y specially severe service	Forged one-piece steel bolt and base spring thimble, or Separable steel bolt and one-piece malleable iron top complete with split thimble, or	1″	4½″ to 5″		⅝″	5½″ to 6″
3	11-15 kv. Interior Districts 6.6 kv. Coast Districts	Malleable iron one-piece pin with split thimble.					
4	22 kv. Interior Districts 11-15 kv. Coast Districts	Forged one-piece steel bolt and base with lead thimble, or Separable steel bolt and one-piece malleable iron top complete with split thimble, or	1⅜″	5¾″ to 6″	3″	⅝″	6″ to 6½″
5	22 kv. Coast Districts	Steel bolt, iron or steel (pipe) base, lead thimble. (Home-made.)	1⅜″	7½″ to 8″	3″	⅝″	6″ to 6½″

Note: Distances are measured in inches.

are too light; type 3, 10 and 12 pins are to be preferred, and of these three, the best standardized types are numbers 10 and 12. However, type 3 is a style which any company can easily fabricate locally, and for this reason must be given consideration. Of the two former types, number 10 has the advantage of strength, while number 12 is to be preferred on the score of first cost and adaptability of separable bolt. Type 10 is usually standardized with a ¾-inch bolt. We recommend against this size and in favor of a ⅝-inch bolt, as this has ample strength when used with these sizes of insulators and wood crossarms and will permit the use of arms with drilling similar to those used with smaller insulators. For instance, by standardizing on the ⅝-inch bolt, companies operating 11 kv. lines in interior districts and along the coast will require but one standard crossarm for lines of this voltage, where otherwise two would be necessary. As to the height of pin above the shoulder, class 4 insulators require at least 5¾-inch, while class 5 requires at least 7½-inch. It may also be noted that the older "standard" insulators, corresponding with class 4 service, required pins 7½-inch above the shoulder. We therefore suggest that companies operating 11-15 kv. lines use pins 5¾-inch to 6-inch above the shoulder, while those operating 22 kv. lines or expecting to replace large quantities of pins on lines insulated with old standard class 4 insulators, use pins 7½-inch to 8-inch above the shoulder. We recommend that bolts be 6 to 6½ inches long. The diameter of the base should be not less than 3 inches to afford a good bearing area to resist bending. As in the smaller class, all metal parts should be galvanized according to N. E. L. A. specifications, and insulators with split thimbles should be furnished with felt insertion.

TELEPHONE SPECULATION IN JAPAN

The number of telephone instruments installed in Tokyo is 45,000, according to the Japan Times. These are handled by several different exchanges, each of which has from 2000 to 7000 numbers under its supervision.

The number of persons who have applied for installations is now 60,000, and will continue to increase. An official of the department of communications has stated that the authorities are of the opinion that it will be possible to satisfy every one of these applicants within ten years, not a very brief period.

There are many reasons why the telephone system of Japan has so much trouble in meeting the demand. In providing for the expense consideration must be given to the time best suited for the flotation of loans. Thus it is impossible to obtain the capital at will, and work is postponed whenever the money market is hard. There is also the question of employees. Since the work involves the handling of delicate mechanism, experience and efficiency are necessary before the workman can do the work satisfactorily. The shortage of hands naturally delays installation. The exchange apparatus used in Japan is imported, and being made for foreign operators, is rather too high or too wide for the Japanese telephone girls, so that their full working capacity can not be attained.

Tokyo is not the only place where private telephone dealers are active, and they may be seen in all the large cities of the country, especially in Osaka, where prices even higher than in Tokyo are often quoted. Today a good call number costs more than 1000 yen ($498.50), while the minimum may be said to be about 750 to 800 yen ($374 to $399).

The authorities have expressed regret that the ratio of telephones to population in Tokyo is only 2 to 100, and are exerting efforts to remove the evil. They ask the nation to wait some years longer, when the demand, they believe, will be amply supplied. They think that by 1929 everything will be made right.

Are you going to accept charity from the boys who fight?

BUY A LIBERTY BOND

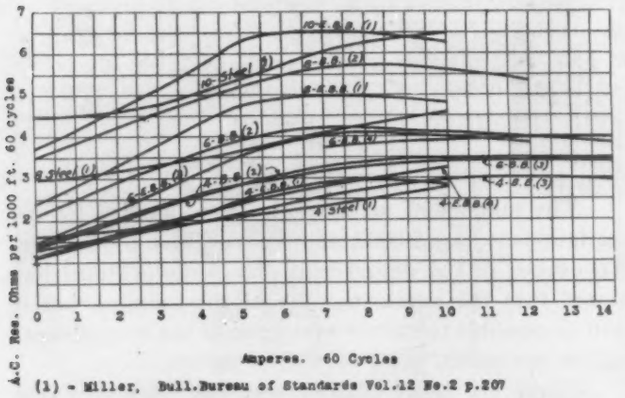
IRON AND STEEL CONDUCTORS

BY R. C. POWELL

(The scarcity of copper, owing to war conditions, has led to the use of iron and steel wherever the substitution is possible. The application of these metals as conductors has created a new situation for the power expert with a new set of problems to be solved. This analysis of the situation, with the results of experiments to date, as presented by the Engineering Committee for the coming convention, is therefore of particular timely interest. The author is electrical engineer with the distribution department of the Pacific Gas & Electric Company.—The Editor.)

The present abnormal conditions and consequent serious effect upon the price and supply of copper and aluminum have brought into prominence the use of iron and steel conductors.

The purpose of this report is to gather together data on the physical properties and economic use of iron and steel conductors, together with extent and



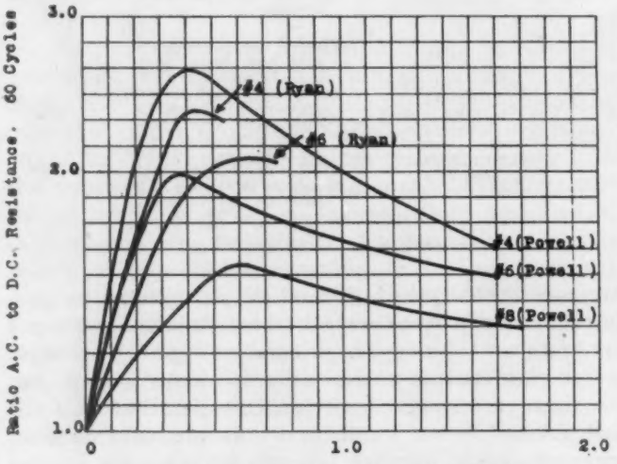
(1) - Miller, Bull.Bureau of Standards Vol.12 No.2 p.207
(2) - Powell, Tests by Laboratory Pac.Gas & Elec.Co.,San Francisco
(3) - Ryan, Elec.Review Vol.71 p.496 Sept. 22, 1917.
(4) - Worcester, Gen.Elec.Rev. June 1916.

Change of A. C. resistance with current—Fig. 1

use and results thus far obtained by Pacific Coast member companies. There are four grades of iron and steel to be considered, E. B. B. and B. B. iron, ordinary guy and Siemens-Martin steel.

Physical Properties

The three physical properties of interest are electrical conductivity, strength, and durability. It is to be particularly noted that for iron and steel there is for all three properties considerable variation among individual samples. It is therefore not advisable to attempt to check constants by comparing the various tests reported. For this reason, also, no attempt will be made to go into the complicaed theory of change of resistance of iron for a'ternating currents, as all the practical information needed may be very simply obtained from test data.



Change of A. C. resistance with current density—Fig. 2

Electrical Conductivity

For iron and steel there is a marked variation of alternating current resistance with the current and frequency. An alternating current is forced to the surface of the conductor, thus cutting down the effective area and thereby increasing the resistance resulting in the so called "skin effect." This effect increases with frequency and magnetic permeability, being zero for zero frequency (direct current) and small for non-magnetic materials (copper, aluminum, etc.) at commercial frequencies.

Fig. 1 gives some test results as reported by various observers. Table I gives the D. C. resistance per mile and the mile-ohm (resistance per mile times pounds per mile), and shows what values may be expected.

TABLE I

D. C. Resistance and Mile-Ohm

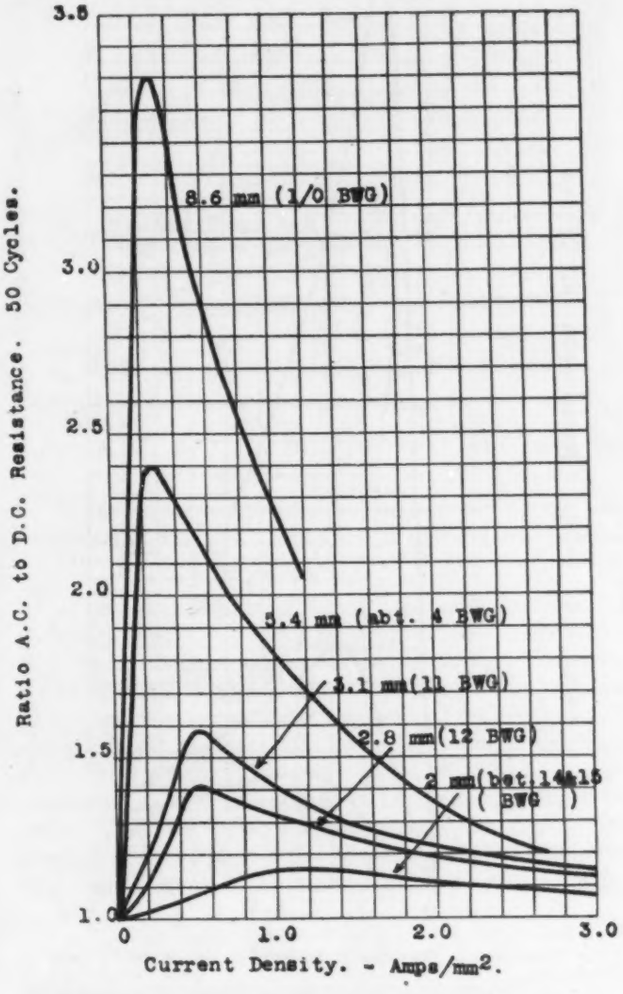
No.		Wt. per Mile	Reported By: Miller (1) Ohms Per Mi.	Miller (1) Mile-Ohms	Powell (2) Ohms Per Mi.	Powell (2) Mile-Ohms	Ryan (3) Ohms Per Mi.	Ryan (3) Mile-Ohms	Worcester (4) Ohms Per Mi.	Worcester (4) Mile-Ohms	Roebling (5) Mile-Ohms
4	EBB	811	6.08	4940					6.08	4940	4600
6	.....	590					7.9	4650			to
8	.....	390	12.4	4840							5000
10	.....	258	19.2	4960							
4	B. B.	811			7.4	6000	7.1	5760			5000
6	....	590			10.	5900	9.0	5300			to
8	....	390			17.8	6950					6000
4	Steel	811	8.6	6980							6000
8	.....	390	15.6	6080							to
10	.....	258	23.7	6100							7000

(1) Bulletin Bureau of Standards. Vol. 12, No. 2, p. 207.
(2) Tests by Laboratory, Pacific Gas & Electric Co., San Francisco.
(3) Ryan, Elec. Review, Vol. 71, p. 496, Sept. 22, 1917.
(4) Worcester, Gen. Elec. Review, June, 1916.
(5) Wire in Electrical Construction. Published by John A. Roebling's Sons Co.

Suppose it were "over here"?

BUY A LIBERTY BOND

Fig. 1 shows the very considerable change of A. C. resistance with current, and the fact that this change is greater for the larger sizes. This is shown better by the curves in Figs. 2 and 3, which give the ratios of A. C. to D. C. resistances varying with current density.


Ratio A.C. to D.C. Resistance. 50 Cycles.
8.6 mm (1/0 BWG)
5.4 mm (abt. 4 BWG)
3.1 mm(11 BWG)
2.8 mm(12 BWG)
2 mm(bet.14&15 BWG)
Current Density. - Amps/mm².

Change of A. C. resistance with current density—Fig. 3

In Table 2 is given the mile-ohm for different amperes for B. B. iron. At 10 amps. the mile-ohm for No. 6 is 10 per cent greater than for No. 8, and that for No. 4 is 49 per cent greater than for No. 8 and 25 per cent over that for No. 6.

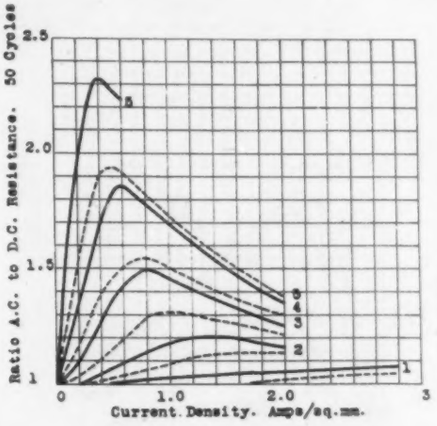
In order to make a proper comparison of the change of A. C. resistance due to size, wires having the same D. C. resistance should be taken. The table has been made up by assuming the mile-ohm for B. B. iron to be 6000 and multiplying the corresponding D. C. resistances by the ratios given in Fig. 2.

The curves in Fig. 3 are taken from the Elektrotechnische Zeitschrift of January 28, 1915. The D. C. resistance given corresponds to 6800 lb.-ohm/mile² and the strength 62500 lbs./sq. in., or the material as regards D. C. resistance and strength is about the same as our ordinary steel guy.

The results given in Figs. 2 and 3 show the impracticability of using large solid conductors as alternating current conductors.

Stranded Conductors

Fig. 3 shows very nicely in a general way the influence upon skin effect of increase in diameter and also that conductors of small diameter show very little skin effect at commercial frequencies. The current



No.	Dotted Curve	Solid Curve
1	1 mm dia. (approx.19 BWG)	7 x 1 mm Strand
2	2 " " " 14 "	7 x 2 " " (approx.1/8" strand)
3	3 " " " 11 "	7 x 3 " " 3/8" "
4	4 " " " 8 "	7 x 4 " " 1/2" "
5	5 " " " 6 "	7 x 5 "

Comparison of change of A. C. resistance of solid and stranded conductors—Fig. 4

TABLE II
Mile-Ohm for B. B. Wire

Size:	No. 8		No. 6		No. 4	
Amp.	Current Density Amps/mm²	Mile-Ohm	Current Density Amps/mm²	Mile-Ohm	Current Density Amps/mm²	Mile-Ohm
0	0	6000	0	6,000	0	6,000
2.5	.19	7600	.137	9,300	.095	9,300
5.0	.375	8800	.27	11,300	.195	12,200
10.0	.75	9600	.535	11,400	.39	14,300
15.0	1.13	8900	.8	10,800	.585	13,700
20.0	1.5	8500	1.07	10,300	.78	12,800

tends to follow the individual strands so that a stranded conductor has a much lower A. C. resistance than a solid one of the same weight and area. However, increasing the area by stranding does not decrease the resistance proportionately, that is, the resistance of a seven-strand conductor is considerably more than one-seventh that of an individual strand.

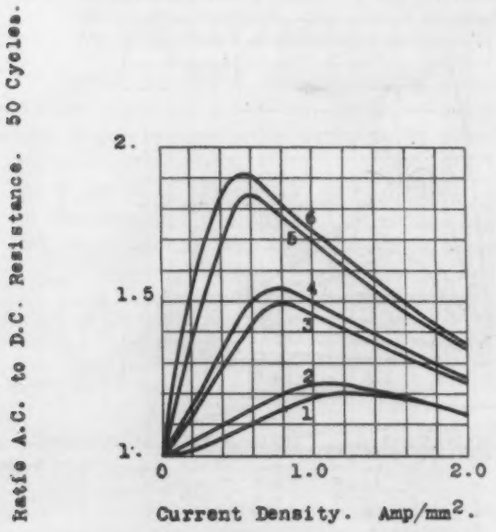
These points are brought out in Figs. 4, 5, 6 and 7, and are taken from the Elekt. Zeit. previously referred to. Figs. 4, 5 and 6 are for steel having a strength of 100,000 lbs./sq. in. and Fig. 7 for steel of 62,500 lbs./sq. in. Fig. 4 shows the increase in resistance due to stranding, on the basis of equal current density, for seven-strand cables. Fig. 5 brings out the point that a small steel cable is more economical in material than a large one and a seven-strand cable more economical than a 19-strand for any given size of strand.

The curves in Figs. 6 and 7 were drawn to show even more clearly the effect of reducing the size of strand. Here a solid wire, a seven-strand and a 19-strand cable, all having approximately the same area

It's not only one nation, but humanity—

BUY A LIBERTY BOND

and weight, are compared. Fig. 7 brings out still more clearly perhaps the marked advantages of stranding. The two sets of curves compare a 1/0 B. W. G. solid and a ⅜-in. (approximately) cable made up of seven strands of No. 11 B. W. G., or 19 strands of No. 14 B. W. G. at 50 cycles.



No.	Stranding	Approx. Size Strand.
1	7 x 2 mm	1/4"
2	19 x 2 "	
3	7 x 3 "	3/8"
4	19 x 3 "	5/8"
5	7 x 4 "	1/2"
6	19 x 4 "	7/8"

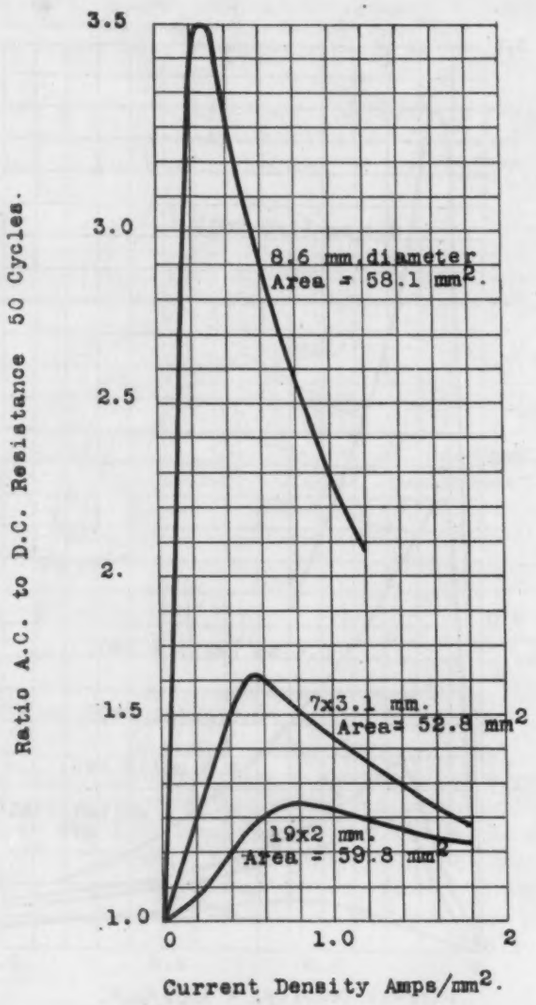
Effect of stranding upon A. C. resistance—Fig. 5

In Fig. 8 are given the results of tests on stranded wire and steel conductors. There is some variation in the data as reported by the various observers, but for the most part the general characteristics are similar. This is shown better in Fig. 9, where the ratio of A. C. to D. C. resistance is plotted against current density.

The ratio of resistance to reactance for iron and steel conductors is very high, the power factor of the line under short circuit being 90 to 95 per cent, so that the variation in voltage drop, due to the power factor of the load and spacing of conductors, is of no practical importance. Therefore, for all ordinary purposes the power factor of the load may be taken as unity.

The voltage drop diagram (Fig. 10) is based on resistance drop, unity power factor and the curves in Figs. 1 and 8. Those curves being taken which give the highest values.

The key to the use of this diagram is shown in the lower right-hand corner. As an example, find the voltage drop due to a 5 amp. load on a 3 mile, 3 phase (or, 1.5 mile single phase) circuit of No. 6 iron. Follow the vertical 5 amp. line to its intersection with the dotted horizontal 3 mile line. Thence, follow the diagonal line through this point to the intersection with the horizontal line through the intersection of the 5 amp. vertical line and the "6" curve. Thence along the vertical line through this point to the volt scale at the bottom, in this case 300 volts.



Comparison of solid wire 7 strand and 19 strand cables of approximately equal areas—Fig. 6

Strength

Among the values for mechanical strength there is as much variation as those for electrical resistance. However, conservative and safe values for the ultimate strength may be taken as:

55000 lbs./ sq. in. for E. B. B., B. B. and ordinary steel guy.

75000 lbs./ sq. in. for Siemens-Martin.

The elastic limit may be taken at 50 per cent of the ultimate strength E. B. B., B. B. and ordinary steel guy may be considered as having about the same strength as hard drawn copper.

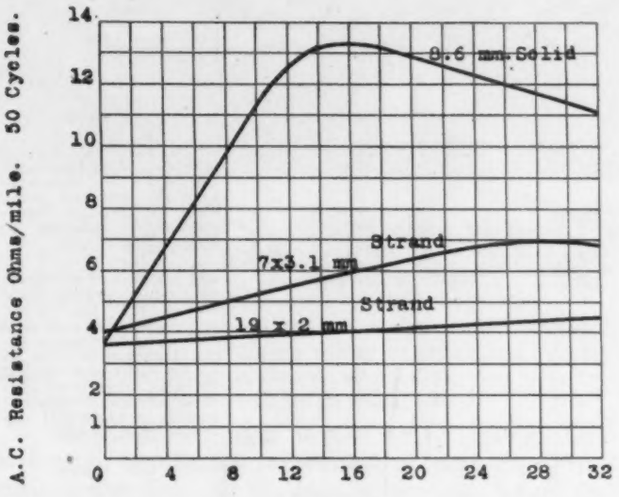
Corrosion

It is well know that iron, and particularly steel, corrodes much faster than copper. Excessive corrosion is apt to be experienced on lines crossing salt marshes or located so as to be subjected to salt fogs or mist. It is doubtful if it is advisable to install any but double galvanized steel conductors, excepting in very dry climates. Stranded conductors, in particular,

There is no cleaner cause.

BUY A LIBERTY BOND

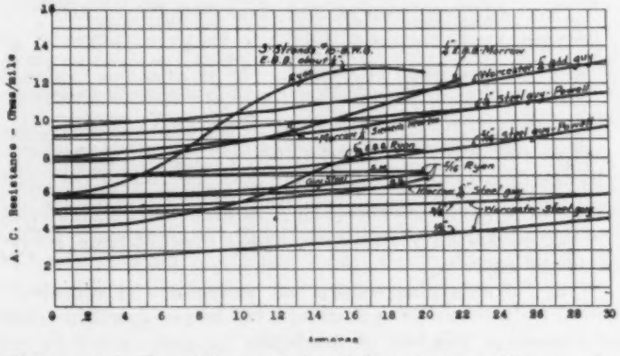
are liable to short life unless well galvanized, due to corroding of the small wires. This form of corrosion is, of course, simply the usual oxidation of iron and steel which is always greatly accelerated by the presence of moisture and salt.


A.C. Resistance Ohms/mile. 50 Cycles.
9.6 mm. Solid
7x3.1 mm Strand
19 x 2 mm Strand
Amperes.
Approximates 3/8" steel strand at 50 cycles.

Comparison of solid wire, 7 strand and 19 strand cables of approximately equal areas.—Fig. 7

There has, however, been discovered corrosion of iron and steel conductors on high-voltage lines which is quite apart from the usual corrosion just discussed.

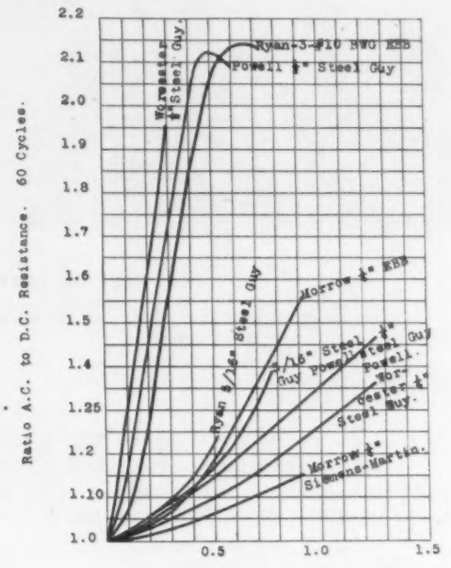
Figs. 11, 12 and 13 show the effects of this form of corrosion on a steel 60 kv. line. This line was installed about 11 years ago and the 3 conductors were ⅜-in. steel guy. The 6 miles of this line were in good condition, excepting at 80 or 90 insulators, which were more or less in the condition shown by the photographs. Fig. 11 shows the corrosion of the conductor, and Fig. 12 that of both the conductor and tie wire,



Change of A. C. resistance of stranded conductors with current.—Fig. 8

which was iron. It is seen that the tie wire is completely destroyed, for a distance on one side, and three or four wires of the conductor are corroded through. Fig. 13 shows very clearly why the corrosion should be so severe at only certain points. It will be observed that just underneath the badly corroded portion of the wire is a fine crack in the insulator. Corrosion was found only at cracked insulators and localized at the crack. The cause is undoubtedly due to excessive corona at the cracks, producing small quantities of nitric acid, which attacks the steel.

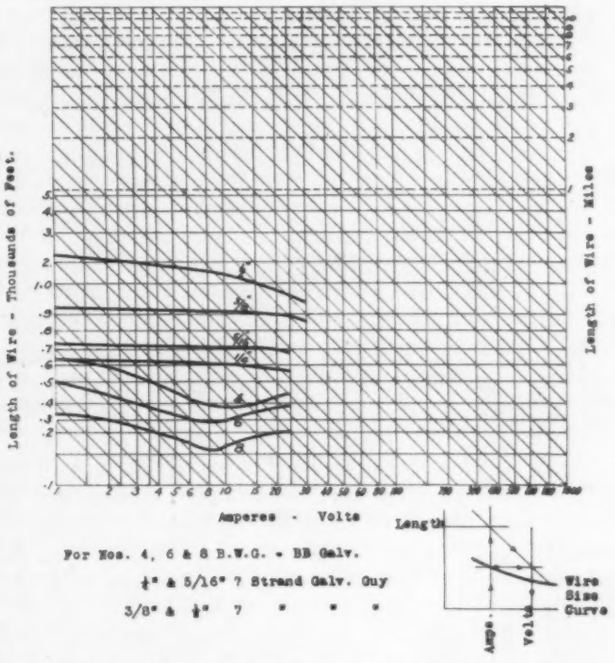
The writer is indebted to Mr. J. P. Jollyman, Pacific Gas & Electric Company, for the information regarding this interesting case of corrosion.



Change of A. C. resistance of stranded conductors with current density—Fig. 9

Use of Iron and Steel Conductors

From the data above presented, it seems that it is advisable to use solid conductors only for very light loads, in general not over 3 amperes. The great increase of resistance with current produces very poor



Voltage Drop Diagram for iron wire (ohmic drop only)—Fig. 10

You can't stay out of it—choose your sides.

BUY A LIBERTY BOND

REPLIES TO QUESTIONNAIRE

Co.	No. Mi. Wr. All Sizes (Approx.)	Voltages Kv.	Class of Service	Span Avg.	Span Max.	Data Given for Certain Lines: Volts	Size	Grade	Load Kva.	Distance, Miles	Remarks
1		22	Brnch. pr. lines		200		No. 4 ¼"	S&M	100 225		
2	Over 70	6.6 and 66	6.6 kv. rural serv. 66 kv. extens'ns			66 66 66	3xNo.10 3xNo.10 No. 8	BB Standard BB Standard EBB	150 1400 750	17.7 2.9 2.7	Satisfactory.
3	4	2.3 and 6.6	Short ext. for small power				No. 10	Iron W. P.			Do not consider iron practicable, account of poor voltage regulation.
4		11	Suburban distribution				No. 4 & 6	EBB			Not satisfactory. Excessive sag from overheating due to excessive load account not being able to arrange interruption to change to copper.
5		2.2 and 10	Short ext. for small power				¼"	Steel Guy			Some years ago attempted to use second-hand No. 4 WP for 2.2 kv. and 10 kv. lines. Found necessary to remove account excessive drop on 2.2 kv. lines and hazard on 10 kv. lines short circuits annealed wire resulting in abnormal sag or loss of strength.
6	Over 300	2.3 to 60	60 kv. br. lines	300		60	¼"	S&M	400	57	Supplies four towns.
			6.6 kv. rural distribution			60	¼"	S&M	200	14	Supplies small town.
			2.3 kv. city primary extens'n	700		60 60	¼" ¼"	S&M S&M	400 350	5 10	Irrigation.
											Transmission line in sleet zone. Supplies two towns.
						6.6	No. 4	BB		5 to 16	Supplies small towns.
						6.6	No. 6	BB			Branch rural lines. Some trouble with voltage regulation, and regulators had to be installed. In certain cases load refused because could not be carried on existing iron lines.
7		13 and 50	Coal mines and suburban distribution	138	196	50 13	¼" 9	Steel Guy BB	1000 75	14 75	Satisfactory.
8	Over 300	2, 5 and 11	Short ext. for small loads	700	1000		¼"	Steel Guy			Loads: up to 400 kva. on 11 kv. circuits.
		and 60	Short rural feeders with small load	700	1000		5/16" ⅜"	Steel Guy Steel Guy			Loads: up to 75 kva. on 2.5 kv. circuits.
			Service lighting circuits		350		¼"	Steel Guy	6.6 amp.		40 ft. poles used for 700 ft. spans and on important highways 45 ft. poles.
			Long spans in transmission lines	1762	3379		⅜" or 7/16"	High Strength			For long spans triangular construction employed, using steel pole top pin.

regulation. For example, the drop per mile of wire for No. 6 B. W. G. for 1 amp. is about 13 volts and for 3 amps. about 52 volts or 4 times instead of 3 times the drop for 1 amp. At 7 amps. the drop is 155 volts or 12 times the drop for 7 times the current. This effect is not so noticeable for stranded conductors up to and including ⅜-in. But, unless special stranding is employed, ½-in. and larger sizes show greatly increased resistance with current. The extra cost and difficulty of obtaining special strand limits the economic use of iron and steel to lines carrying small currents.

There are, nevertheless, a number of applications for this material, particularly at the present time. Some of these are:

1. For supplying small loads where size of copper required for mechanical reasons is much larger than demanded on account of line loss or regulation.

2. For short primary services, and in case of short distances and light loads even 2300 and 4000 volt services, especially in agricultural districts where load is seasonable.

3. To supply temporary industries or construction work from 11 kv. or higher voltage lines. Many of these loads, shipbuilding plants, etc., are coming on now which will be discontinued at or shortly after the conclusion of the war.

4. Extensions of 11 kv. or higher voltage lines in agricultural and country districts to take on small loads with little or no prospect of increase.

5. Country extensions of 11 kv. or higher voltage lines where it is considered that steel strand will take care of demands for three or four years, and that difference in future and present price of copper will pay for change to copper

Think what the spectacle of cheerful giving means to the enemy.

BUY A LIBERTY BOND

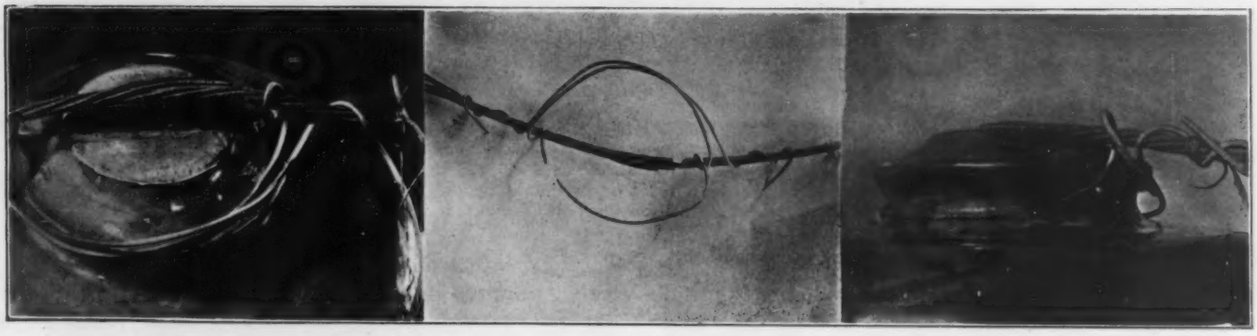


Fig. 11 Fig. 12 Fig. 13

CORROSION OF HIGH TENSION STEEL CONDUCTORS

A form of corrosion due usually to cracks in the insulator. Fig. 11 shows corrosion of the conductor. In Fig. 12 both the conductor and tie wire are eaten through. Note in Fig. 13 that a fine crack in the insulator shows just below the badly corroded portion.

three or four years hence. Or, where difference in present and future financial conditions render it advisable or necessary to construct lines as cheaply as possible, even with the knowledge that copper would be more economical.

The greater strength of steel over copper enables savings to be effected in the cost of supports by increasing the span. If the span is increased where the load within a few years will probably require copper, it is well to consider making the span double that used for copper.

In order to obtain some information as to the extent of use and results of operation of iron and steel conductors, a questionnaire was sent out to companies operating on the Pacific Coast.

The replies received are tabulated above. It is to be noted that causes of unsatisfactory operation are:

(1) Poor regulation, and

(2) Excessive sag, caused by short circuits or overload, only, however, in cases where solid wire was used.

ELECTRICITY IN LOGGING AND SAW MILLS

In a recent issue of the General Electric Review, E. H. Horstkotte points out that with an ever increasing demand for lumber and the necessity of logging in the more inaccessible places in our forests, there has been a continually increasing cost in bringing logs to the mills. Increased demand for lumber called for a more rapid and cheaper method, and as a result the powerful steam donkey was developed. Superseding this there came the electrical logging engine which, after five years of the most conclusive tests, has proven that where electrical energy can be transmitted at a reasonable cost, it is as superior to the steam donkey as the steam donkey is to animal power.

Performances of the electric donkey taken during the past few years have shown that when compared with other methods of logging, the electrically driven outfit will handle logs at a decreased cost per thousand feet and at an increased rate per day. It also has the following distinctive features:

Will safely withstand the severe service to which it is subjected.

Can transport itself through the woods.

No fires to build or water to haul.

No wood to cut and consume, using timber which could otherwise be converted into a commercial product.

No boilers to freeze or explode.

Eliminates sparks, which are the source of many forest fires.

The power is usually transmitted at 11,000 or 22,000 volts from the generators located at the mills, where there is always an abundance of cheap fuel, to a portable substation located in the area which is to be logged.

After a decade of operation, often under most severe service conditions, the electric drive in saw mills has proven its value whether in the cutting of the giant firs of the Pacific Coast, the pines of Minnesota and the Rocky Mountain states, or the hard woods of the South.

In a modern electrically driven sawmill, the non-condensing engine has been supplanted by a high-speed, highly efficient condensing steam turbine, this change resulting in a great saving in boiler capacity, steam consumption, and floor space. All line shafting and large belts are practically eliminated, thus removing many obstructions to the lighting, and allowing a better distribution of machinery, with a marked reduction in the construction cost. The elimination of a large number of bearings reduces the fire hazard from hot boxes, which has a very noticeable effect upon the insurance rates.

A comparison of the quantity of oil required by steam and electrically driven mills of the same capacity shows that there is a large saving in this item. In fact, a comparison of the operating costs of a large number of steam and electrically driven mills shows that there is a decided reduction in the cost of operation of the latter. This can be accounted for by a reduction in the number of millwrights, oilers, and helpers about the mill; saving in renewals of worn-out bearings, belts, etc.; oil, minimum number of shut-downs due to breakdowns, a constant rate of production throughout the entire mill, and lower insurance rates.

For service outside the mill storage battery locomotives, motor-driven transfer cars, mono-rail cars, and traveling cranes have been developed, each having its particular advantages for different installations. All of them are successfully driven by electric motors.

Think—if we should fail?

BUY A LIBERTY BOND

POWER PLANT LOSSES

BY R. J. C. WOOD

(To save is to serve—with this in mind, the power companies of the West have worked toward interconnection of power lines and efficiency in operation as the greatest war service which they may perform. A detailed survey of the saving possible in the power plant itself, as well as an analysis of the larger problem, is forcefully set forth here. This paper, which is presented by the superintendent of power of the southern division of the Southern California Edison Company, is one of a group of powerful discussions offered by the Engineering Committee for the coming Pacific Coast Section, N. E. L. A., convention.—The Editor.)

The theory of the conservation of energy, as defined by physicists, is that energy is indestructible, changing in form but never in quantity. Such a definition, while no doubt rigorously correct, neither conveys the popular conception of the matter nor the subject of this paper.

What we have to deal with in commercial engineering and operation is the utilization of our sources of energy with a minimum of waste. We are concerned in seeing that our energy does not change into forms that are of no commercial use. The possible sources of waste in a hydro-electric generating plant may be classified as follows:

1. Loss of flood water due to insufficient storage facilities.
2. Loss of flood water due to any reduced carrying capacity of canal and pipe lines.
3. Loss of water under diversion dams.
4. Leakage from canal and pipe lines.
5. Overflow of spillways.
6. Friction losses in pressure mains.
7. Failure to utilize all the available head.
8. Water wheel losses due to poor design of buckets and nozzles, or wear of the same and interference with tail race water.
9. Unsuitable number of machines in operation.
10. Station light and power including camp use.

The storage facilities of the Southern California Edison Company are located upon Big Creek, the initial construction of dams affording a storage of 51,600 acre feet in Huntington Lake. With this amount of storage, and assuming a market for all the power, a total of 156,000 acre feet would have been unavoidably wasted during the years 1910 to 1916, inclusive, as overflow during the run-off period, the total run-off being 789,000 acre feet. The dams were raised last year, increasing the storage to 88,400 acre feet, and with this capacity the overflow waste would have been reduced to 83,000 acre feet, or 10.5 per cent of the total run-off. The saving of 73,000 acre feet corresponding to about 230,000,000 kwh. or 885,000 barrels of fuel oil.

Further conservation of water is possible in this project by the driving of tunnels which will increase the area of the watershed draining into Huntington Lake, and by building dams in the higher levels, increasing the total storage.

Loss of flood water has been experienced particularly in our Mill Creek plants due to the growth of hellgrammites in the gravity canal. These little animals form a sheath of leaves and small particles of debris, cementing it around themselves, and they attach themselves to the sides of flumes, tunnels and pipes. The Mill Creek gravity line is of 36-inch concrete pipe with steel syphons where canyons are crossed. The normal carrying capacity of this line is 25 second feet, the grade being 2 feet per 1000.

With the accumulation of hellgrammites the capacity of this pipe has been reduced to 21 second feet. Our station chief has devised a pipe sweeping machine which is pulled through the conduit by a rope. This effectually removes the hellgrammites and restores the carrying capacity. Fortunately, these accretions on the pipe only exist at its upper end, rarely extending more than a mile down from the intake.

In favorable seasons where heavy rains occur at the beginning of the rainy season, the sand carried in suspension in the water causes the hellgrammites to "let go," but in seasons where no large amount of flood flow occurs, recourse must be had to pipe sweeping.

In our Lytle Creek plant where there is a four-mile 20-inch concrete pipe conduit, the station chief has achieved good results by tying up a bundle of brush and slipping it into the pipe at a manhole; the water carries the bundle along with it, sweeping as it goes.

Our smaller hydro-electric plants have diversion dams which do not go to bedrock, as it would entail a relatively tremendous expense to cut off the under flow in this way. A portion of this otherwise wasted water has been saved at Lytle Creek by the sinking of a shaft and installation of a centrifugal pump run by a 100 horsepower motor. This installation was effected in co-operation with the water company, and they obtain an additional six second feet which increases our generating output by 180 kw., so that after deducting the power required to run the pump there is a net gain of about 90 kw. or 66,000 kwh. per month, equivalent to 250 barrels of oil.

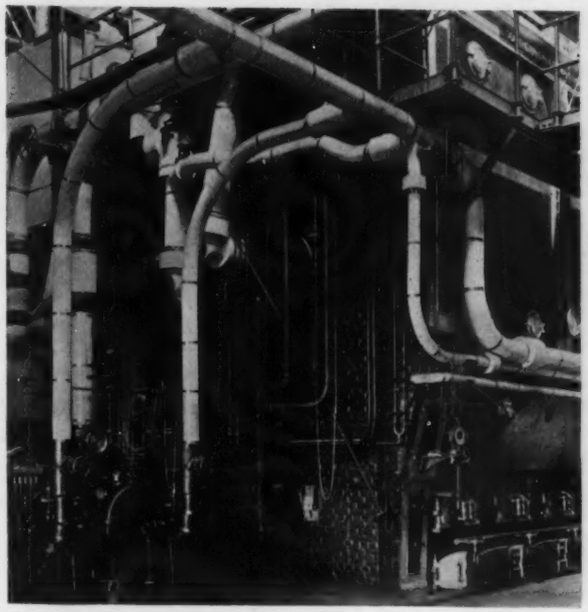
Leakage from concrete pipe lines has nearly always been found at the joints, roots of trees having penetrated and forced open the joint. Such a leak from a buried pipe, if of small amount, is hard to find, the best indication being the extra luxuriance of the floral surroundings.

Regarding the overflow from spillways, this is a fruitful source of difference of opinion between operators, superintendents, and water companies. We have found a graphic water level recorder to be the best cure.

Friction losses in pressure mains are usually beyond the control of the operator except as to occasional internal inspection to determine their condition.

Are you merely a stow-away—or do you pay your way?

BUY A LIBERTY BOND



ECONOMY MEASURING APPARATUS—I

To save in the boiler room the soot should be carefully blown from time to time and an accurate record kept of the various factors that lead to a knowledge of the state of combustion in the furnace. In the view to the left is shown a soot blower installation, while to the right may be seen meters for recording the draft, temperature of chimney gas leaving the boiler, feed water temperature, carbon dioxide (CO_2) in the chimney gas, and temperature of the chimney gas leaving the economizer. One set of this apparatus is provided for each pair of boilers at the Long Beach Plant of the Southern California Edison Company.

Failure to utilize all available head is also chiefly a matter of original design, although some small economies may sometimes be effected by the use of flash boards at spillways. At our Kern River No. 1, for instance, the spillway was raised two feet, adding 32,000 kwh. per month.

In the older plants there are many possibilities of increasing the efficiency by equipping them with modern nozzles and buckets. This, however, requires an expenditure which in most cases cannot be incurred under present conditions. The output of our Santa Ana River No. 1 plant was increased in this way from 2200 kw. to 3600 kw., not that this was all due to increased efficiency, as the new buckets and nozzles were larger than the old ones, permitting of greater output. At Kern River No. 1 a change of buckets and nozzles made by the original builders of the wheels raised the efficiency from 82 per cent to 85.5 per cent. This indicates the advisability whenever ordering a new set of buckets to replace worn out ones, of giving the manufacturer a chance to supply an improved type.

Flooding of impulse wheels by tail race water can sometimes be remedied by the operator, but is mostly a fault in design.

Where less than full load water is available, it is important to cut down the number of units so that those in operation may be economically loaded. We have noted a gain of 50 kw. when one out of four 750 kw. units has been cut out in one of our smaller plants, the losses of one unit being eliminated.

Under the head of station light and power, we include all electricity used for lighting and heating camp cottages. This requires constant supervision, and we are seriously considering the metering of each individual house in camp. In Mill Creek No. 2, 3, we formerly had two water-wheel driven exciters, and although the nozzles were as small as they cou'd be consistent with freedom from plugging, there was a waste of water; recently an induction motor was connected to one of these exciter sets, and being normally driven above synchronous speed, we are enjoying the spectacle of the station light and power meter running backwards, the power being supplied to the transmission line from the exciter set.

Some of these savings and economies may seem almost trivial; it is however, no valid argument against them to state that a certain proposed economy will be so small that it will never be noticed among the hundreds of millions of kwh. generated annually by a system of generating plants. Very possibly we will not be able to actually demonstrate the amount of a saving by means of meter readings, but if we know that the economy has been effected, we are justified.

After our best efforts have been expended there will necessarily be unavoidable losses; 100 per cent is the objective; our success is not in attaining, but in how closely we approach it. The distribution of the losses in typical hydro-electric plants is given in Table I for three stations of different sizes, and it appears that with the best of care and fairly modern apparatus about 75 per cent of the total energy of the water can be delivered to step up transformers for transmission.

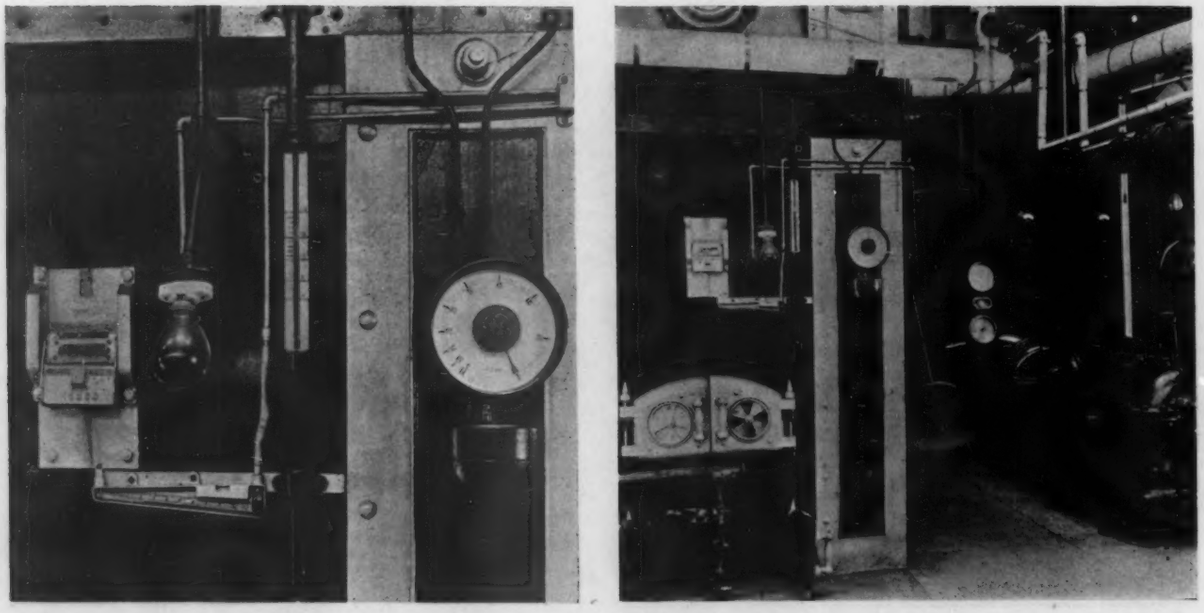
TABLE I

Losses in Hydraulic Plants

Kw. Capacity at Plant:	32,000	%	20,000	%	3250	%
Water energy at diversion.	42,800	100	27,200	100	4820	100
Energy at wheel nozzle...	40,870	95.6	25,030	92.0	4350	90.2
Energy at generator shaft.	33,330	77.9	20,900	76.8	3455	71.6
Delivered to bus bars.....	32,000	74.8	20,000	73.5	3250	67.4
Delivered to step up transformers	31,937	74.6	19,920	73.2	3235	67.1

You call them "our boys"—are they yours?

BUY A LIBERTY BOND



ECONOMY MEASURING APPARATUS—II

Meters for individual units often prove helpful, as do particular sets of instruments for steam supply to the larger power units. In the view to the left is shown the steam flow meter, carbon dioxide (CO_2) indicator and draft gage installed on the front of each boiler unit. Note that the CO_2 meter registers 14 per cent andthe draft .23 in. To the right is seen a steam flow meter, a draft gage and indicating carbon dioxide (CO_2) meter on the boiler front and the Venturi meter for measuring the total feed water of eight boilers on a 20,000 kw. steam turbine at the Long Beach Plant of the Southern California Edison Company.

The energy leaks in a steam plant are many and various, and are as follows:

1. Loss to stack.
2. Low heat absorption by the boiler from soot on tubes or scale within them.
3. Blow down losses.
4. Steam to burners.
5. Radiation.
6. Blow off loss from safety valves.
7. Turbine losses.
8. Rejected to circulating water.
9. Net auxiliary power.
10. Generator losses.
11. Station light and power other than item 9.
12. Standby losses.

The losses due to imperfect combustion are apt to overshadow all others in the average plant, and in order to keep them down to a minimum at the Long Beach Steam Plant, we have an efficiency engineer whose main duty is to watch the boiler room operation. Each boiler is equipped with a CO_2 machine which records upon a chart, and also has an indicator mounted upon the boiler front, close beside it is a draft gage showing the draft on the boiler side of the boiler stack damper, and a steam flow meter. The fireman is instructed as to the draft that should be maintained according to the steam flow, and he operates primarily in this way, the CO_2 indicator being used as a check. The recording CO_2 machines are further checked up frequently with a portable Orsat machine. It is found to be entirely practical to keep the CO_2 at about 14 per cent, indicating but 20 per cent of excess air, corresponding to 2 per cent of the energy of the fuel.

With the advantages of a free country go its responsibilities.

BUY A LIBERTY BOND

The temperature of the gases leaving the boilers varies from 500 degrees F. to 600 degrees F., depending upon the total evaporation. The true average temperature of stack gases is exceedingly difficult to measure. In an attempt to get reliable results we have used a resistance thermometer distributed over the whole gas passage, but even then inaccuracies are present, due to variable gas velocities over the cross section of the flue. At the best, with 14 per cent CO_2, and 550 degrees F. gas to stack, there is a loss of 17.4 per cent of the fuel energy that goes up the stack. Realizing this, the boilers feeding the largest of the three turbines in the plant are equipped with economizers. The gases leave these at a temperature of from 200 degres F. to 250 degrees F., the efficiency is increased by about 7 per cent at rated load and by 10 per cent at 160 per cent of rating, the unavoidable loss with 14 per cent CO_2 and 250 degrees temperature being 10.2 per cent.

Soot on tubes or scale within will increase the temperature of waste gases; we find that after two and one-half months operation, the temperature of the waste gases in a certain boiler had risen to 670 degrees F. Careful hand cleaning reduced them to 595 degrees F., denoting an increase in efficiency of 1.9 per cent.

We are now experimenting with a soot blower installation permanently made a part of the boiler equipment, but it has not been in service long enough at the time of writing to enable the results to be judged.

Tube scale is a matter of water quality and treatment. We only find it necessary to clean boilers once every three months, and the scale is very light. It would be interesting to know if the permutit system of water treatment had given satisfaction on a large scale, and to get some accurate data upon the amount of blowing down required compared to what is necessary with other systems of water treatment.

The loss from blowing down boilers may be con-

siderable. In ordinary practice, we blow off about 18,000 pounds of water in twenty-four hours from each boiler in constant service. This loss of heat amounts to 0.6 per cent of the heat in the steam output of the boiler during the same time and in actual quantity represents 1¼ barrels of fuel oil per boiler per day. If due to leaky turbine condensers salt water gets into the boilers this blow down loss may be increased several hundred per cent, and with twenty boilers in operation, may amount to some 100 barrels of oil per day. To watch this matter intelligently, water is sampled from each boiler, and the amount of salt determined chemically; it having been determined by exhaustive tests that a concentration of over 200 grains to the gallon causes priming. Constant daily tests are also made of the condensate water and condensers are overhauled whenever the salt exceeds one grain per gallon.

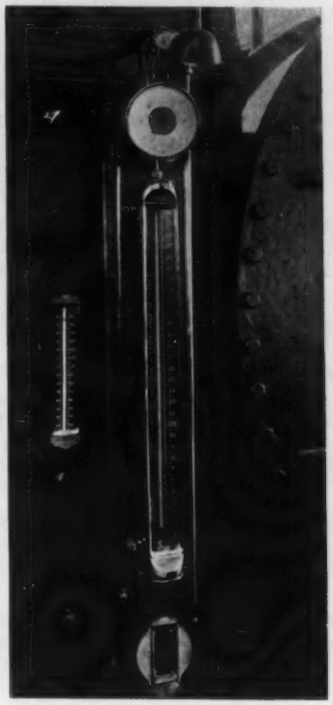
Steam used for atomizing the fuel is a double waste; first, on account of its loss; secondly, because the make up water that replaces it brings scale forming impurities into the boilers. Our experiments indicate that there is no magic in any particular burner, and the wonderful savings effected after installing somebody's patent burner are chiefly due to greater care in damper regulation.

In order to save atomizing steam, burners should be crowded to the limit as, at all events, with one type of burner we use, the quantity of steam necessary for good atomization is almost independent of the quantity of oil being burned. In a boiler equipped with four burners nearly half the atomizing steam can be saved on half load by cutting out two burners and loading up the rest. This burner steam is by no means negligible, amounting to 5500 pounds per hour for a 20,000 kw. load requiring 23,000 pounds of fuel oil per hour.

Radiation losses from boilers can be reduced by the various heat insulating materials that are upon the market. It requires a good deal of study, by one prophetically inclined, to equate the value of the oil that will be saved in the next five or ten years with all the expense of heat insulation. In the meantime, it might be advisable to paint the boilers white.

The loss from safety valves blowing can be minimized by having an indicator in the boiler room to show how many valves are open on the turbine or to show the kw. load upon it, whichever is the more feasible.

Safety valves should also be kept in adjustment so that the difference between their blowing and closing pressures will not be excessive. The losses in turbines are inherent to their design, reference now being made to blade losses; it is extremely valuable to have the means of checking the steam rate from time to time as fouling of blades, erosion, or damage from foreign bodies passing through will be detected. The blading of all turbines should be inspected once a year if possible, assuming the turbine to have been in daily service. Accumulations of scale in the blading may sometimes be removed by pumping coal oil in while a minimum amount of steam is keeping the machine up to speed. At times such methods fail and the turbine must have its blading cleaned by hand. The real remedy is to treat the boiler water so that it will not foam over and, as previously noted, to keep the condenser tight. If an accumulation of scale or dried mud is found upon the steam screen near the throttle, no time should be lost in checking the trouble, or blading will be eroded, and it is extremely uncertain these days as to when new blades will be obtained.



ECONOMY MEASURING APPARATUS—III

The temperature and pressure of the steam and water from the boiler down through the condenser need careful attention in the economic operation of the modern power plant. On the left is exhibited the vacuum gage, barometer and thermometer installed between the first and second pass of the steam turbine. Note the vacuum of 29.15 in. with the atmospheric barometer reading of 30.1 ins. To the right may be seen recording meters for inlet and outlet temperatures of the circulating water, steam temperature, vacuum and steam pressure, and the temperature of the condensate. The Klaxon horn at the right of the meter board sounds an alarm when the oil pressure accumulator drops. This installation is at the Long Beach Plant of the Southern California Edison Company.

People who have less than you are giving.

BUY A LIBERTY BOND

The greater part of the energy of our fuel oil is thrown away into the condensing water; roughly, about 60 per cent is thus wasted. The only help is to be found in cold circulating water and plenty of it; an apparent paradox where the colder the water and the more there is of it applied, the less heat it absorbs. That vacuum is the source of economy should be drilled into every engineer. Assuming no actual damage occurs to a turbine, about all the engineer can do to enhance its economy is to keep the condenser tight and clean on the water side, and to go after every possible leak on the steam side and to keep the vacuum and circulating pumps in first-class condition. In some tests made on a 20,000 kw. turbine carrying 17,300 kw., a leak one-twentieth of a square inch in area reduced the vacuum 0.2 inch.

The various auxiliaries in a plant may be either steam or electric driven, or both. In the latter case the greater plant economy will result from running sufficient steam auxiliaries up to the capacity of the feed water to absorb the waste steam, hot feed having the advantage over cold in not checking the boiler evaporation so greatly when emergency calls are made.

Generator losses are fixed by design except that when operating two or more machines in parallel, fields should be adjusted to give the same power factor to each, thus eliminating cross currents.

Lights and the operation of various pumps for circulating transformer oil and water, drainage, fuel oil, and other occasional uses, comprise an item generally known as station light and power. According to the system in use, this may also include electrically driven turbine and boiler room auxiliaries.

The final economy of the Long Beach Steam Plant for the year 1917 was 238 kwh. per barrel. This is after deduction of station power. The total energy generated was 133,528,000 kwh., giving a local load factor of 32.47 on a plant capacity of 47,000 kw.

In all auxiliary plants which may be called upon instantly to pick up load dropped by some portion of the system in momentary distress, further losses occur in keeping boilers hot beyond the normal operating capacity. This is insurance, and if desired, must be paid for.

Of greater national importance than the elimination of all waste possible in individual plants, is the larger problem of operating all generating plants that can be interconnected for the greatest combined efficiency. The principles are simple, the application sometimes extremely difficult.

1. All hydro-electric plants upon streams without storage must be kept fully loaded to the extent of the available water, and if the market will not absorb all the power at certain times of day or seasons of the year, interconnection with other systems must be sought and the surplus power utilized.

2. Hydro-electric plants with storage must have the water used at such a rate that their peak load value will be available when most needed, and in this way keep down the investment in steam auxiliary plants.

3. Hydro-electric plants with storage must so adjust their daily load curve as to enable the auxiliary steam plant to produce its quota of kwh. with the fewest number of turbines in the least number of hours.

4. The more efficient steam plants must be operated to the exclusion of the less economical, transmission losses being considered. The criterion being that the aggregate oil burned in all plants shall be a minimum.

As stated, difficulties beset the operator attempting to conform to the ideal. He is hampered by lack of interchange capacity in lines, frequency changers and transformers, expediency as regards shutting down the small steam plants and reducing insurance against interruptions, and other details of operation beyond the scope of this paper.

As an indication of what has been done, and is in process of completion, may be mentioned:

1. The increase of the storage of Big Creek plants, and their operation so as to utilize all the water of constant flow plants and maintain as nearly as possible block loads upon Long Beach Steam Plant, and the minimizing of the number of turbine hours of operation.

2. Interconnections with the Southern Sierras Power Company through a 5000 kw. frequency changer by which their surplus hydro-electric power is utilized.

3. The burning of all available natural gas at Redondo Steam Plant to save oil.

4. Interconnection with Mt. Whitney and San Joaquin Companies, eliminating oil other than for standby, by operating generators at Kern River No. 1 at 60 cycles upon their systems.

5. Transmission line to Santa Barbara nearly completed which will transfer approximately 7,000,000 kwh. annually from a small, relatively inefficient plant to Long Beach Steam Plant.

6. Interconnection under way with San Diego Consolidated Gas & Electric Company through two 5000 kw. frequency changers at Capistrano, which will transfer steam load to Long Beach Steam Plant.

The time will come when the generating plants of California will all be interconnected and with full development of our bountiful water powers, the necessity for steam will diminish, not perhaps to the vanishing point, but to a proportion that will not be a burden upon our oil production on one hand, nor upon the other will the fluctuating cost of oil materially affect the cost of power.

A HINT TO THE TRADE IN CUBA

American manufacturers are frequently called upon to make sales of their products to individuals or companies that are not prepared to pay the full purchase price, and in such cases it is a matter of great importance to retain control of the article until all of the terms of the contract have been satisfied. Particularly is this true of machinery and other articles of relatively high value, for which the full purchase price is ordinarily not immediately available. The practice common in the United States, whereby goods are sold on the installment plan with reservation of the title until the full price has been paid is, however, not applicable in Cuba, where the word "sale" is understood to mean a complete transfer of ownership.

The plan which has been followed successfully by some of the largest American companies is to lease, or rent, the goods with an understanding that the rent paid shall apply on an agreed purchase price. When this has been paid in full the title passes to the purchaser.

The average American has a better opportunity in life than the average German. Why?

BUY A LIBERTY BOND

TRANSMISSION AND DISTRIBUTION LOSSES

BY R. E. CUNNINGHAM

(Electric service is one of the necessities of war. Along with munitions and aeroplanes, its production must be stimulated rather than cut down. The only saving possible in the present situation, therefore, is in the elimination of losses, and it is this topic which has been taken up for primary consideration by the Engineering Committee for the coming war service convention of the Pacific Coast Section of the N. E. L. A. This paper, by the superintendent of electrical distribution of the Southern California Edison Company, covering losses on transmission lines as met by that company, is one which merits careful consideration.—The Editor.)

A study has been made of the transmission and distribution systems of the Southern California Edison Company in the attempt to determine where the various losses occur, and to devise ways for reducing these losses. On account of present conditions it is necessary to conserve for useful purpose, as far as possible, all current generated, and any changes in the system which are proposed for reducing the losses must be made at a minimum expenditure on account of the stringent financial conditions. The investigation reported herewith covers the period from January 1st to June 1st, 1917, and does not represent the conditions since the consolidation with the Pacific Light & Power Corporation, but data shown is sufficient for the purpose of discussion.

During this period there were installed on the transmission system step-up and step-down transformers totaling 288, with capacity aggregating 265,375 kilowatts; on the distribution system there were installed 2376 10,000 and 15,000 volt transformers, total capacity 39,265 kilowatts, and 8032 2200 volt transformers, total capacity 67,293 kilowatts. Total number of meters 129,678. An average peak of 65,000 kilowatts with a load factor of 58.

The power generated at the various plants on the low tension bus bars is stepped up for transmission to various main substations, where it is stepped down to proper distribution voltages and metered before being delivered to the distribution system. Our consumers' services are again metered, as well as power delivered to street light circuits, or used for station light and power purposes in the generating plants and substations. With such an arrangement it is possible to sub-divide the various losses between the generators and the consumers' meters into the following classifications: Power house losses, transmission line losses, transformer losses, substation losses, distribution line and other losses, and consumers' meter potential losses. There is submitted herewith a chart of one dimension, which will serve to show the losses in the various classifications mentioned in proportion to the amount of power sold through consumers' meters.

All power used at generating stations and substations for the operation of auxiliaries, lighting, etc., is separately metered at each station. It has recently been found that considerable economy can be effected by careful attention to the use of power in the stations; lights being needlessly used during the day and often more at night than necessary; also electric heaters and similar appliances allowed to operate when not required. Strict orders have been issued to economize on use of station light and power as far as possible.

The losses on transmission lines and transformers have been determined by subtracting the output of substations from the amount generated at the various power houses; the proportion of line loss has then been determined by calculating the transformer losses. It will be seen that the transformer losses are a large portion of the total transmission losses, being 9.87 per cent as against 4.88 per cent line losses. Transformer losses appear excessive; this can be explained in a large degree by the fact that step-up transformers are necessary at the power houses as well as step-down transformers at the substations, and under certain conditions current must be stepped down a second or third time before the proper voltage is obtained for distribution. Copper losses in the transformers are in proportion to load, while core losses are constant and continual. One suggestion which can be given for reducing transmission losses, therefore, is to disconnect spare banks of transformers when they are not actually required to carry load.

The transmission line losses are fixed by the size of conductors, and without spending additional money for increased size of copper, which is prohibitive at this time, there is no way of reducing line losses except by judicious dispatching of load and the operation of synchronous condensers or motors, where available, to reduce to a minimum the idle current which might otherwise be transmitted over a long transmission line.

Distribution losses have been determined by subtracting total consumers' meters from the output of the substations. Knowing the total number and size of distribution transformers, their losses have been calculated and subtracted from total losses to determine the distribution line loss combined with the unknown losses, such as stolen power and slow meters. As in the case of the transmission losses, it will be noted that the distribution transformer losses form a large portion of the total distribution loss. Line losses may, in the case of our company, appear to be extremely small, but we attribute this to the fact that a number of large blocks of power are sold directly from substation buses or distributed over comparatively short lines.

Much could be said in regard to the most economical size and arrangement of conductors on the distribution system, but as this would result in the purchase of additional copper at a high market, the question must be passed at this time.

Unknown losses consisting of slow meters and stolen power we believe to be a very small percentage

The world thinks us merely commercial—

BUY A LIBERTY BOND

of the total losses. Routine meter tests, and tests requested by the business office when meters show "no consumption" has resulted in keeping our meters in very fair condition. Cases of stolen power have become rare occurrences, especially since the passage of laws by which the companies can properly prosecute parties who have been discovered stealing current. We may therefore look to the matter of distribution transformer losses for effecting economy in distribution.

All transformer installations supplying strictly power service should be provided with switches on the primary side so that they can be disconnected from the line when not in use. Our standard form of contract specifies "that the consumer will disconnect the transformers when plant is not in operation." We have met with success in carrying out this arrangement to a large extent, we believe, on account of the fact that we make it easy for the consumer to disconnect his transformers by installing the switch in convenient location where it can be operated from the ground.

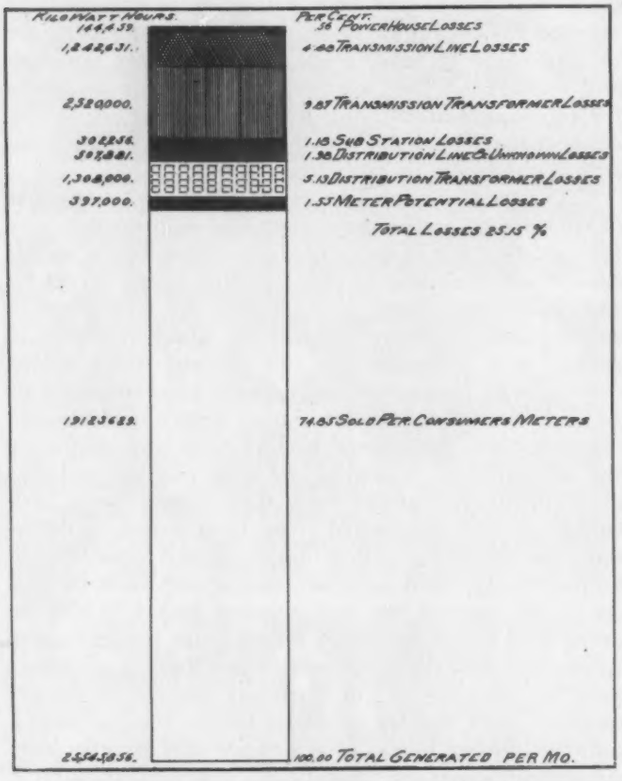


Chart showing types of losses on transmission lines

Transformers on our 10,000 and 15,000 volt systems are protected by pole top switches and in most cases supply strictly power load. Installations on the 2200 volt lines often carry a mixed load and it is impossible to arrange for disconnecting them when not in service; however, when 2200 volt transformers carry strictly power load they are also equipped with pole top switches for disconnection. During the period of our investigation there was a saving in energy, by keeping transformers disconnected when not in use, averaging 360,000 kwh. per month, and as we were operating part of our load by steam during this period, this was equivalent to a saving of 1840 barrels of oil per month.

The Industrial Accident Commission has accepted the pole top switch, if placed convenient to the plant, as equivalent to an entrance switch just inside the building. This fact, together with a saving in core loss justifies the additional cost of the pole top switch.

"Keep transformers well loaded" is a good rule to follow. Underloaded transformers mean additional core loss. If you are having only very infrequent burn outs it is a pretty good sign that the transformers are not working to their capacity.

When distribution lines are extended into new territory, in most cases it is impossible to forecast the final distribution of load, and the usual practice is to install small transformers at more or less frequent intervals, as the load develops; later, as opportunity permits, it will be found that a large saving in transformer losses can be brought about by placing larger transfermers systematically located, so as to reduce the total kilowatt capacity and total number of transformers installed. This operation is popularly known as a "clean up."

We have found it advisable to test all transformers when received from the manufacturers, so as to be informed as to their characteristics and losses. This practice not only applies to transformers owned by the Company, but it is understood that when transformers are purchased by customers to be connected to our lines they must pass through our test department and be accepted by the company.

Meter potential losses form only a small per cent of the total losses, and the only way to make a reduction is to gradually replace the old types of meters which have high potential losses. The new type 5 amp. induction meter has a potential loss in the neighborhood of one watt, as against five watts for the old T.R.W. meter. As the T.R.W. meter runs slow a short time after being calibrated it can be easily shown that on alternating current circuits the expense of replacing them with induction type meters is soon paid for by the reduced cost of routine tests and the saving in lost power.

If you have the necessities of life you can afford one.

BUY A LIBERTY BOND

BUSINESS CONDITIONS IN RUSSIA TODAY

"The Russian farmer is back at work on the land and living on his own produce," reports Charles L. Preston, a prominent New England shoe and leather man, who has just returned from a trip to Vladivostok on a special mission for the Bureau of Foreign and Domestic Commerce, Department of Commerce. "So far as food is concerned he is not badly off, but he is putting very little on the market. He barters for the little he needs in the way of manufactured goods."

The business stagnation in Russia, explains Mr. Preston, is due in part to the depreciation of the ruble and to restrictions on the banks. Transfer of money by banks from one city to another is forbidden, and depositors are not allowed to draw more than 250 rubles at a time.

BUSINESS BUILDING
SELLING IDEAS
DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS
COST KEEPING
ESTIMATING

RETAIL SELLING PRACTICE

(A remarkable analysis of the problems which confront the electrical dealer has been worked out by a sub-committee consisting of H. F. Allen, E. B. Criddle, H. A. Lemmon, M. L. Scobey, with L. H. Newbert as chairman, under the Commercial Committee of the Pacific Coast Section, N. E. L. A., for the coming convention, and is here presented. There are definite suggestions for future action on the part of the individual and the group, as well as much good advice given by those who have studied the problem at first hand and who know how to meet difficulties, because they have met them and succeeded at the game. The questions of store location and business methods are taken up in this issue—selling practices and advertising will appear later.—The Editor.)

Preliminary Statement

The merchandising efficiency of the electric dealer is a problem that intimately affects the welfare not only of the dealers themselves, but the manufacturer, the jobber, and the central station. Though, therefore, this paper is primarily intended to assist the dealer in adopting selling methods in line with the best modern practice of successful retailers in other branches of business, it must be understood throughout that the wholehearted support and co-operation of manufacturer, jobber and central station are imperative if the present division of labor amongst the four branches of the electrical industry above named is to be the success which it undoubtedly can be.

Unfortunately, conditions have arisen in the past, in many towns and cities, which have opened a breach between dealer and central station until both parties seriously doubt the good faith of the other when co-operation is mentioned, with the inevitable result that new business has suffered thereby.

An analysis of many such cases shows that the fault lies almost invariably:

(1) In a lack of understanding of the principles of merchandising on the part of the local agent of the central station and hence an inability to view the problems which may arise from the dealers' point of view.

(2) Poor business methods on the part of the dealers.

(3) Lack of co-operation amongst the dealers themselves

(4) Lack of co-operation between the dealers as a unit and the central station.

This paper will endeavor by a brief review of modern merchandising methods as adopted by successful retailers to assist the dealer and central station in correcting the first two faults enumerated above, but true success is also entirely dependent upon the co-operation between dealers as a unit and the central station.

Your committee would earnestly recommend that in every town and city there be founded a local association of electrical dealers and contractors and that this local association meet together with a representative of the central station at least once a week to discuss in a friendly spirit plans for the increased sale of electrical energy and appliances amongst the community served.

For consideration in this paper the problems which face the electrical retailer will be classified into divisions as follows:

(1) THE STORE. Its location, rent, arrangement, and management.

(2) THE COST OF DOING BUSINESS. The purchase of stock, the necessity of quick turn-over of stock, accurate cost keeping, price filing.

(3) SELLING METHODS. Getting the customer in; special campaigns, window displays, the salesman.

(4) ADVERTISING.

THE STORE—

Store Location—It may be fairly presumed that the reader of this paper will be already located in some town or city, and that the point which will interest him most is if his present location is best adapted to his business, but there may be some who desire to start in business or who feel that there are greater prospects in some other community.

In selecting a town there are several things to be considered. First: Market. Is there already a demand or can a demand be created for the articles to be sold? Second: Competition. To what extent is the field occupied? A large city by weight of its natural growth may often absorb and support a new plant or store or distributing center, whereas, in a small town the advent of a new competitor may spell disaster alike to the established houses and the newcomer.

In selecting a town in which to locate, therefore, the following items should be fully investigated:

(a) Population, with growth for past five years and reasons for assuming that it may or may not increase year by year.

(b) Possible total number of customers.

(c) Number of existing dealers in electrical supplies and merchandise.

(d) How do these dealers treat their customers, and what is the public feeling regarding them and their method, and prices?

(e) Are they aggressive in going after business or do they wait for it to come in?

(f) Since electrical dealers are often contractors also, what is the character of the work being done by them, and are their charges reasonable?

(g) What proportion of the residences and business houses are already wired and using electrical energy, and to

When the house is on fire is no time to hoard the water.

BUY A LIBERTY BOND

A STREET SCENE WITH AN OBJECT LESSON

Not an electrical dealer's—but with a lesson which may be electrically applied. To the purchaser of household electric appliances the appearance of greasy wire with working tools thrown helter-skelter around in the electrical contractor-dealer's store, is strange and novel in some respects, but in the last analysis it is as repulsive to the customer—usually a woman—as this barber shop on the streets of Canton, China, is to the American citizen desiring a clean, wholesome shave.

what extent are they already adequately served, the people receiving good work at reasonable prices?

If the present dealers are moderately busy, if the town is not growing or customers are already well supplied with appliances, the location is obviously a poor one in which to start a new business, though it might be possible to buy out one of the existing houses and build up a good business.

If, on the other hand, the town is growing rapidly, an investigation may show that there is room for a new man who knows his business and is alive, aggressive and dependable.

The selection of the location of a store in any town or city is a problem which rarely receives the consideration it deserves, but it is one which may vitally affect the success or failure of an enterprise, and that this is appreciated by large manufacturers and wholesalers is shown by the stress laid by the credit managers of these companies upon desirability of location for the particular business concerned when considing aplications for credit.

Among the determining factors in selecting a location are the following:

(a) Accessibility—Selection of Neighborhood

In selecting a store for the sale of electrical appliances the considerations involved differ greatly from those which would affect the location of a grocery, a cigar store, or a cafeteria. For the articles sold in these stores there is a continuous demand, and whereas the grocery might be most successful in the heart of a residential district—the cafeteria in the heart of the office district, and the cigar store on the main business thoroughfare, it is possible and even probable that an electric store might not be successful in any of these districts.

In general, the demand for electrical appliances must be created:

First: by attractive window display. Second: by advertising. Third: by solicitation. It is essential, therefore, that the store shall be in such a location that the right people shall see the window display and that it shall be easily accessible to the prospective customers influenced by the advertising or by the solicitor. There is also the undoubted advantage of being near the office of the power company, due in the first place to the fact that a large number of customers will first seek advice from the company regarding appliances, and will then naturally seek the nearest store to follow out the advice given by the company's representative; and in the second place to the natural connection which forms in a person's mind between the payment of the electrical bill and lamps or any other appliances which may be needed.

Fortunately, as a rule, the offices of the central station are located in the down-town shopping district, which is as a rule the ideal location for the electrical dealer's store.

A little consideration will show why the shopping district should be preferable to the others for, though in the wholesale or office district hundreds more people may pass the store in a day, their minds are intent on other matters and very few will notice the window display, however attractive it may be, or even be aware of the store's existence. On the other hand, it will be found that the sales of the great majority of electrical appliances are influenced by women, the great majority of whom carefully watch the windows in the shopping district, which is also always easily accessible from all parts of the town or city.

Supposing that the shopping district (if possible, in the neighborhood of the power company's office), has been decided on, there may still be a choice as to position in the block, side of the street, or immediate environment.

The corner of a block is always considered the most desirable location, but as the rent of a store in this position is usually at least 50 per cent greater than a store of the same floor area in the center of a block. it is doubtful, when taking into consideration the peculiar conditions affecting an electric appliance store, if this additional overhead expense is normally justified.

It will be found in every street that pedestrian traffic is attracted to one side of the street rather than the other. This may be due to the sun, the wind, or to some store which is a particular attraction. No rules can be given governing this, and only careful observation can determine which is the better side. For instance, in mild climates, the sunny side is, as a rule, the more popular, provided it is not exposed to very strong winds.

The question of immediate environment is also one of importance. The store should not be set back from those adjoining it and the character of the busi-

After all, you are only saving money.

BUY A LIBERTY BOND

nesses carried on in the adjoining premises should be more likely to attract attention to the electrical store than to detract from it. For instance, a furniture store with well displayed windows, would be an ideal neighbor, whilst as an extreme example in the other direction, no woman would be predisposed towards a store located between two saloons.

Store Rent

It is obvious that the amount which may be expended on rent must also depend largely upon individual conditions and that it is impossible to give any general rules governing this. The amount expended for rent by successful retailers in other lines would appear to vary from 2½ to 10 per cent of the gross sales and a fair average would be from 4 to 6 per cent.

It is, however, certain that the efficient dealer who is willing to pay a fair rent for an attractive store in a good accessible retail district, will be far better off ultimately than one who endeavors to conduct his business from a workshop in a side street; on the other hand he will also be more successful than the man whose profits are largely absorbed in maintaining an elaborate high rental establishment which can never be efficiently used to bring the total sales up to the point at which the rent would be a reasonable proportion.

A store which will just attractively display all the goods for which there is a reasonably quick turn-over is all that is required.

There can be no set rule for the arrangement of the store that will fit all cases, but there are a few ideas and suggestions that will be of use to all whether they be large or small dealers.

Always bear in mind that you are dependent largely upon sales to women and that they are lovers of cleanliness, and in order to attract and keep their trade your store, stock and fixtures must be kept in order, cleaned, polished and dusted.

The store floor and sidewalk in front of the store should be thoroughly swept daily and the windows should be washed as often as necessary to insure cleanliness, the show cases cleaned and goods on display in them kept in order, always seeing that samples are replenished from stock.

Make your store attractive, so that people will want to come in, keep it cool in summer and warm in winter and have it always well lighted. Provide seating accommodation for lady customers who would perhaps become tired and nervous if compelled to stand. A table with current literature would be desirable.

It is absolutely essential that nickeled goods, such as toasters, percolators, chafing dishes, grills, etc., be dusted every day and that they be cleaned and polished at least once a week, regardless of whether they are kept in show case, wall case, or on a display table or shelving.

A few dollars expended for standard repair parts, tools and equipment to take care of this part of the business is just as necessary to success as it is to carry flatirons and sockets.

When a customer brings in a cord to be repaired, don't belittle the business by taking out pliers and screwdriver and making the repair in his presence.

Whatever it is, take the article and, after getting his name and address, give him a repair check, telling him how much the cost will be and when it will be ready.

If you say it will be ready at 5 o'clock, see that it is ready at 4:45, for by making a promise and keeping it, you gain the customer's confidence, whereas if you fail to have it ready when promised, the customer is almost always annoyed by the uncalled-for delay, and if repeated, he is apt to go elsewhere the next time he needs something electrical.

The repair department should be away from the store proper, preferably in the basement or at the back of the store with a partition shutting it off from public view, as a repair bench at best is unsightly and far from being attractive.

If your means will permit, give your goods the consideration that is due them. For instance, it would be well to have percolators, chafing dishes, tea-samovars, water heaters and toasters displayed in wall cases with glass doors, so as to be not only kept away from dust, but to be in full view of the customer at the same time.

Show cases should contain heating pads, curling irons, vibrators, hair dryers, immersion heaters, shaving mugs, flashlights or any other small devices of a similar nature.

Electric heaters and fan motors can be displayed nicely on low, felt covered benches, or on separate stands or pedestals, and if a dealer carries art metal library and boudoir lamps they can be displayed either on a wall rack, preferably with shelves of graduated width, or on separate stands or pedestals.

One of the most important articles on sale in practically all cases is the flatiron, and some thought and care should be used in its superfluous verbiage display.

As it is the appliance most called for, it is the writer's opinion that samples of every make and size carried in stock should be displayed on an open table, either felt or velvet covered, and the height of the table or counter should be taken into consideration.

If it is too high, the woman looking for an iron has to exert herself when lifting it up for inspection and may be discouraged from buying it for that reason, and if too low, she will be obliged to stoop over and that is an evil almost as bad as the other.

A profitable factor in the electrical dealer's business is the sale of Mazda lamps, and it is such a generally known and used article that some dealers pay no heed to its sale and display, taking the business as a matter of course, one that needs no sales talk or attention; but it should be given consideration from several viewpoints.

It has been suggested to the writer by a prominent dealer — and his point is well taken — that the lamp counter and stock should be well beyond the center of the store, for the reason that 40 per cent of the customers come into the store for the sole purpose of purchasing one or more Mazda lamps, and naturally go to

No ruler forced us into war—we choose our leaders.

BUY A LIBERTY BOND

No woman could go by this window without looking in—and thus the first step in the creation of a demand for electrical appliances has been taken.

that part of the store where they are kept and displayed.

By having them at the back of the store, the customer (in the majority of cases a woman) passes your show cases, display tables, etc., and in many instances her attention is attracted in passing to some new device she has heard of. She will perhaps inquire about it, thus giving a chance for demonstration, often times resulting in an immediate sale, or perhaps a promise to purchase at an early date.

One of the best methods of showing various sizes and styles of lamps is to have a piece of O. B. tubing (preferably square), 3, 4 or 5 feet long, according to available space, with 9 or 10 pull chain sockets connected up, which enables the displaying of standard lamps from 10 watt size up to 100 watt type C, as follows:

1— 10 watt clear Mazda.
1— 15 watt clear Mazda.
1— 25 watt clear Mazda.
1— 40 watt clear Mazda.
1— 50 watt clear Mazda.
1— 60 watt clear Mazda.
1— 60 watt frosted Mazda.
1— 75 watt clear Mazda C.
1— 75 watt frosted Mazda C.
1—100 watt clear Mazda C.
1—100 watt frosted Mazda C.

In quite a number of cases the customer is undecided as to just what sized lamp she wants, and with display rack as outlined, she can readily decide which one is best suited to her needs.

In connection with lamp sales, I wish to point out a suggestion made by another prominent dealer, and that is that he finds it advisable to have the standard sizes of lamps wrapped, ready for delivery, in packages of one, two, three or six, as the customer may require, thereby facilitating the sale and often selling six lamps to a customer who would perhaps otherwise buy only five.

On the other, another dealer points out that he prefers to test and wrap the lamps in the customer's presence, thereby showing that the lamps are in good shape and at the same time giving her an opportunity of looking around the store while the package is being wrapped.

The package containing articles purchased should be neatly wrapped up and handed to the customer, not merely pushed across the counter. Change should be counted out either into the customer's hand or onto a rubber mat from which it can readily be picked up.

In this connection, let me mention that in tying up a package, no harm can be done and much good may come from your putting in a little booklet, blotter or flier describing some new or useful article.

Any manufacturer will be glad to supply you with an ample quantity of advertising matter such as this, with your imprint thereon, and if consistently used, it will be the means of your making additional sales.

The display of miscellaneous material such as batteries, sockets, plugs, switches, fuses, extension cords, etc., is one that must be given careful consideration.

If displayed in cartons on shelves or in trays on a counter, they must be kept in order.

It is the writer's opinion that these articles should be kept at all times readily accessible, but out of sight as much as possible.

Another dealer points out that he is getting good sales results in having similar articles openly displayed on tables, each in a cardboard tray especially made for that purpose, about 8 inches by 12 inches, and 2 inches deep, covered inside and out with an imitation oak paper.

As stated before, the contractor-dealer must gain the confidence of his customers in order to succeed and one way to help get this much-needed confidence of the public is to have each and every article tagged and priced in plain figures, so that if an article is priced at $7.50, the customer has reasonable assurance that that is the price and John Jones is not going to get the same thing for $6.75. I mention this because I have personally gone into shops where goods have been priced in code, and while I may have purchased that for which I went in, it did not tend to strengthen my confidence in the place, because I had a sneaking idea that while they told me the price was $11.25, they might turn around and sell the same thing to Bill Smith for $9.00.

Don't sell or stock any article that you haven't the utmost confidence in or any article the merits of which are doubtful, and on which there is apt to be a

Are you passing yourself off as patriotic?

BUY A LIBERTY BOND

comeback, for it only means a black eye to your business.

Satisfy yourself that any and all articles you sell are what they should be, and that the manufacturer of them is a reputable concern and says that they are what they are represented to be, and then you or your clerks can stand up before any customer and tell him freely and frankly that the article you are selling him is made for that purpose, will do the work, and that not only the manufacturer but you personally stand behind it, and that if it does not do or is not as represented, it will be made right or money cheerfully refunded.

You may get away with cheap, shoddy goods once or twice, but you can't build up a business on that basis and the electric contractors and dealers must make an effort to put their business on the firmest footing possible.

The question of store lighting is also to be considered.

A year or two ago, I am fairly safe in saying that the electrical dealer's store was about as poorly lighted, if not worse, than any other business house in his town.

One of the principal revenues of the contractor-dealer is in recommending and installing up-to-date and better lighting systems for other merchants, while he himself has practically no lighting at all, and if this brother-merchant is a thinker—and we believe he is—the chances are that these recommendations will be taken with quite a few grains of salt, because, why should he improve his lighting at the dealer's suggestion when his present system of illumination is far better than that which the dealer has in his place of business. However, I am glad to be able to say at the present writing, that the lighting of the contractor-dealers' stores is greatly improved and quite up to date and that almost any merchant would take their suggestions or recommendations for better lighting.

THE COST OF DOING BUSINESS—

The profit in any retail business is the difference between the selling price to the consumer and the cost of the goods plus the cost of selling, and it is essential in these days of fierce competition from without and within, that the electric dealer should know both these figures accurately, and not only know them, but carefully analyze them. If he believes that his costs are greater than they really are, he may believe himself in danger when he is actually doing well or, which is far more common, he may underestimate his costs and actually be within reach of a financial crisis.

Accurate knowledge of costs will not eliminate competition, but with exact knowledge it is certain that most dealers will hesitate before cutting prices down to below cost line.

These rules for figuring costs and profits are recommended by the National Association of Credit Men:

(1) Charge interest on the net amount of your total investment at the beginning of your business year, exclusive of real estate.

(2) Charge rental on all real estate or building owned by you and used in your business at a rate equal to that which you would receive if renting or leasing it to others.

(3) Charge in addition to what you pay for hired help an amount equal to what your services would be worth to others; also treat in like manner the services of any member of your family employed in the business not on the regular pay roll.

(4) Charge depreciation on all goods carried over on which you may have to make a less price because of change in style, damage or any other cause.

(5) Charge depreciation on buildings, tools, fixtures, or anything else suffering from age or wear and tear.

(6) Charge amounts donated or subscriptions paid.

(7) Charge all fixed expenses, such as taxes, insurance, water, lights, fuel, etc.

(8) Charge all incidental expenses, such as drayage, postage, office supplies, livery or expenses of horses and wagons, telegrams and telephones, advertising, canvassing, etc.

(9) Charge losses of every character, including goods stolen or sent out and not charged, allowances made customers, bad debts, etc.

(10) Charge collection expense.

(11) Charge any other expense not enumerated above.

(12) When you have ascertained what the sum of all the foregoing items amounts to, prove it by your books, and you will have your total expense for the year; then divide this figure by the total of your sales, and it will show you the per cent which it has cost you to do business.

(13) Take this per cent and deduct it from the price of any article you have sold, then subtract from the remainder what it cost you (invoice price and freight), and the result will show your net profit or loss on the article.

(14) Go over the selling prices of the various articles you handle and see where you stand as to profits, then get busy in putting your selling figures on a profitable basis, and talk it over with your competitor as well.

The above rules will repay the most careful study, for every item enumerated means some charge which must be deducted from the gross sales before any actual profit can be figured.

Turning Over the Stock

Rules 1 and 4 above, bring out the importance of reducing to the lowest efficient limit the capital investment in stock. By efficient limit is meant purchasing only such articles as can be disposed of within a reasonable time from the date of purchase. Every item should be bought with the idea that a purchaser must be found for it within that length of time.

Over-buying is continuously depreciating the value of good merchandise, and only the old-fashioned retailer any longer takes any pride in the placing of huge orders. The modern buyer takes pride in the fact that he has created a desire for newer merchandise in his customers and has never stocked above the efficient limit.

In some of the most modern department stores, the efficient limit is placed at two months, whilst the majority of the merchandise is supposed to be turned over twice a month. The limit of two months may be rather low for some forms of electrical merchandise, though there seems to be no reason that this length of time should be very much exceeded, if both buying and selling are systematically done.

This question of turn-over is of the utmost importance and the modern dealer is not, as his predecessor was, content to know at the end of every twelve

A free man has greater responsibilities than a slave—

BUY A LIBERTY BOND

THE STORE	THE BUSINESS
Located in a live town.	Costs figured on sound basis.
With not too heavy competition.	Stock kept moving.
In the shopping district.	Capital investment kept down.
With good neighbors.	Perpetual inventory.
Rent proportionate to sales.	Monthly balance sheets.
Repair department in rear.	Overhead accounted for.
Attractive shop arrangement.	Stock up to date.
	Profit figured on selling price.

months his turn-over on his stock as a whole for the previous year, but he insists on knowing at the end of every month what his turn-over has been on each particular line. This monthly report enables him to keep his fingers right on the pulse of his business the year round and makes it possible for him to eliminate items which show a loss, to bolster up those that are weak, and to forecast his buying needs with the greatest accuracy.

The Perpetual Inventory

Turn-over is found by dividing the approximate laid down cost of all goods sold by the cost of the average stock kept in hand over the period in question, and only some form of perpetual inventory enables these costs to be obtained with any degre of accuracy.

It is impossible to describe in detail any system of bookkeeping for retailers. It is, however, considered worth while to describe the perpetual inventory in its simplest form and which, except in the case of very large stores, can be kept up to date by the salesman or saleswoman in charge of the store in the interims between waiting on customers, and in addition to their other duties.

This system necessitates one card for each item of material carried in stock. This card shows at the top a description of the item, from whom purchased, and the manufacturer's number. The left hand shows the quantity purchased, the date and the laid down cost. The right hand side ruled for month and days, shows the number sold and also the price at which sold.

In making a sale the salesman must show on the sales slip a sufficiently clear description of the goods sold to enable the person who keeps the cost cards to identify them. From the duplicates of these slips the cards posted every day with the number of each particular item taken from stock and a balance of each card struck at the end of the month.

It is important that no goods whatever should be taken from stock unless a sales slip is turned in. If the goods are on approval or removed for any reason except for sale, it should be so stated and marked on the card accordingly.

An analysis of the balance taken from the cards will show him at once: (1) if he is making sufficient margin of gross profit on every line; (2) if he is overstocked; (3) if he is not buying sufficient quantities of any one line; (4) if a line is slow moving and needs special sales energy put behind it.

Now let the dealer, having before him his stock report as taken from his perpetual inventory, draw up a form showing the various charges which comprise his overhead expense, including all those laid down in the rules issued by the National Association of Credit Men, and figure his overhead charges for the month.

He will now be in a position to prepare a balance sheet which will show very closely his financial condition at the end of the month and which will enable him to compare the results of that month with any previous month, and to tell not only if he is progressing or falling back, but also where and why he is progressing or falling back.

All this may sound rather complicated, but as a matter of fact the only real trouble involved is in the first stock taking and initial writing up of the cards.

The perpetual inventory does not take the place of the regular yearly or semi-yearly inventory, as some errors will be bound to creep in and the perpetual inventory cards should be corrected by the regular inventory.

It must be borne in mind that profits are made on turn-over and a large part of the cost of doing business can be blamed on idle capital tied up in slow moving stock. Many failures are attributable to this cause. Goods turned over twelve times give twelve times the gross profits of goods turned over once, and the capital is earning more than twelve times as much. No goods should be handled that cannot be turned over by progressive sales methods at least once in four months, and the aim should be to turn over the value of all stock not less than once in 60 days.

If at the expiration of a reasonable period certain lines have not been sold at the regular prices, first make a special effort to find the right purchaser for them; offer the salesman a bonus to sell them. If they cannot be sold this way put all this poor stock on a bargain table away from the good stock and sell it at a loss if you have to, but sell it. Get your capital, or all you can of it, out of this dead stock and get it to working again.

Directly you see from the inventory cards that any line is moving slowly, get it up in some prominent position in your store, put a specially attractive card on it, advertise it, try to find the customer it would most appeal to and galvanize fresh life into that line. It may become one of your best sellers.

Watch your overhead. Don't forget that articles sold at laid down cost plus any percentage less than your overhead is being sold at a loss. Certain staples such as lamps, are easily sold and involve little selling expense and at the same time bring customers into

You are responsible to the next generation.

BUY A LIBERTY BOND

your store to see the rest of your goods and may therefore be excepted from the above rule, but in general sell nothing that does not bring in your laid down cost, plus your overhead, plus a fair profit. To this should be added a small margin to cover depreciation of stock and losses on goods necessarily sold at lower prices unless this has already been figured in on the overhead.

Do not go to the other extreme and not buy sufficient stock. First lay out your capital in those lines for which you know you have a demand, then carefully invest the balance in goods for which you know you can create a demand. Watch the trade papers and manufacturers' samples for new appliances which would be likely to interest your customers, and make each salesman turn in a special report every time a customer asks for some electrical appliance which you have not got in stock, and if there appears likely to be sufficient demand for it, stock it.

Make a point of purchasing nationally advertised articles. The manufacturers are creating a demand for you and have a reputation to maintain. The selling expense of nationally advertised articles is generally less for these reasons and it pleases a customer to be immidately supplied with what they demand.

In concluding this section, it may be of interest to quote "eleven reasons why the percentage of profit should be figured on the selling price and not on the cost," as given in a pamphlet issued by the Burroughs Adding Machine Company:

(1) Because the remuneration of salesmen is figured on a certain percentage of the selling price.

(2) Because the percentage of expense in conducting a business is based on the selling price. If you talk per cent profit on cost and per cent expense on the selling price, where are you?

(3) Because the mercantile and other taxes are invariably based on a percentage of the gross sales.

(4) Because the sales totals are always given in books of record, cost totals are seldom if ever shown.

(5) Because a profit must be provided for two items of capital—one the capital invested in merchandise—the other the capital necessary for operating expenses and other expenses not properly chargeable to merchandise account. This is only possible by figuring profit on the selling price.

(6) Because it indicates correctly the amount of gross or net profit when amount of sales is stated. The percentage of profit on sales is indicative of character of results of year's business—percentage of profit on cost is not.

(7) Because allowances in percentages to customers are always from selling price.

(8) Because no profit is made until same is actually effected.

(9) Because nine stores in ten which do not figure on the selling price get mixed somewhere in their figures and do not know whether they are going backwards or forwards.

(10) Because the big stores figure on the selling price.

(11) Because if you go to the cash drawer you can say "10 per cent of that money is my profit," instead of having to say, "10 per cent of the cost of the goods which I sold for that money is my profit."

SURPRISE TESTS were used recently by the Southern Pacific Company to ascertain just how effective their safety system was in practice. These tests took the form of the display of danger signals at unexpected places, the manipulation of home semaphore and interlocking signals, removal of markers; extinguished lights, and the display of wrong numbers on caboose and engine indicators. In every test such as those mentioned, trainmen detected every signal and reported every error. The percent of efficiency shown by the total of tests conducted on every division was 99.77. The few failures noted were mostly of a technical character, such as the observance of speed regulations and matters which do not involve the immediate element of risk.

It might not be a bad idea to experiment a little on your own employees and learn how effectively they can meet an emergency and how understandingly they are carrying out your ideas in the conduct of your business. You might stage an irate customer—or one who was looking for something out of the ordinary in your stock—and see how your salesmen meet the situation.

CO-OPERATIVE ELECTRICAL WORK IN THE INTER-MOUNTAIN COUNTRY

BY U. S. G. TODD

Nature's storehouse of electrical energy in the Rocky Mountain section is of such vast magnitude that its development, while it has made tremendous strides, is yet but in its infancy. Just at the present time, while our resources and energies are required in the assistance of the cause of Liberty, the advancement in any new project must of necessity be abandoned.

However, those who can see far enough in the future, may very conservatively predict that the transcontinental railway lines will be operated by electrical energy developed by these immense mountain resources.

In a general way one can conceive in a very limited view of the possibilities of water power development, without having had a personal knowledge and close contact with mountain streams winding their way through the paths of least resistance in this mountainous country, and as increased activity and development of power is assured, the allied industries connected with the electrical business will of necessity expand and grow.

We have made such rapid strides in the electrical world since the perfection of the electric lamp that the phenomenal growth is being commented upon from all sides. It will be but a short time until the command, "do things electrically," will be practically obeyed, and this one thing will result in a very practical reduction in the production cost of almost everything required by the consumer.

Co-operation by the allied electrical men will perhaps have more to do with winning the war than any other one line of industry, for by electricity we not only produce but we conserve. Indeed, we materially strengthen and develop the national resources that would have otherwise remained dormant.

There is no greater satisfaction.

BUY A LIBERTY BOND

NEEDED:—COMMUNITY OF INTEREST

BY T. E. BIBBINS

(Not socialism—but an ideal of co-operation, which is a very different thing—is coming to be the watchword of the electrical industry in the West. A plea for general good feeling and for specific good dealing between branches of the industry is here made by a man who has always stood for the best in these ideals. This article by the president of the Pacific States Electric Company is submitted as a part of the report of the Commercial Committee for the Pacific Coast Section, N. E. L. A., convention of next month. —The Editor.)

In the days of long ago the electrical jobber, when confronted with an infraction of a rule or price by his competitor, found a method of disposition which we can tell about today because of the statute limitations. The offender was brought before the court and tried, and if found guilty he was punished by the levying of a substantial fine, or in some other effective way. The Department of Justice at Washington and its enlightening influences have shown the inadequacy of this, to say nothing of the hazard to one's freedom of movement or the choice of wearing apparel. A better way by far has been found. Today, instead of discussing the question of price, the electrical jobbers as a class find it better to discuss a principle involving the ethics of business, resulting in the recognition of the right of others to live, and to do business and prosper.

One of the strong factors in bringing this condition about was the gradual growth of confidence in each other, and odd as it may sound, this confidence has been established best through a method of play, such as golf, and other pastimes, where the qualities of the sportsman are brought out and developed to a high degree. The facilities for knowing the true worth of a man are greatly helped where the jealousies of business are set aside and the competitor assumes the role of play-fellow. As a development of discussion, one of the earlier lessons in our primary class was that an investment, if wisely placed, was entitled to earn a fair return. In the case of a bond, the returns are proportionately small. When money is invested in merchandise and in the giving of service a greater return is necessary. It did not take long to learn that after the dollar is invested in the merchandise, 15 cents must of necessity be added to this, in order to pay for the cost of warehousing the merchandise the dollar has purchased, rent, clerical hire, sales effort, etc., and if the merchandise is sold for $1.15, then not even the small rate of the bond interest would be returnable, and in that case we are simply swapping dollars. Therefore, it is necessary to again add a sufficient amount which would justify the investment in the merchandise after the 15 cents has been added to the dollar.

Other and more profound questions dealing with business problems have been developed as a result of these discussions. Undoubtedly there have been many unethical practices set aside as a result of the searchlight of discussion.

The wholesale merchandiser—the electrical jobber—has his problem, and this obviously he cannot discuss with his competitors, as to how much money he is warranted in spending in the way of investment in merchandise, which he anticipates should be sufficient both in quantity, quality and assortment to serve his other friends in the electrical business. He must watch the horizon, with all the keeness of a troubled skipper of the ship for the storm which may break over his head and show itself in declining demands, leaving on his hands a merchandising investment out of proportion with the reduced volume of business, and the depreciated value is a danger here. Under the circumstances, when he considers the amount for his compensation on his material he must include a fair amount in insurance against this depreciation. He must incur other expenses — he must find means of letting the buyer know that he has the goods on hand. This is a function of advertising and salesmanship—all of which costs money. These and other burdens are responsible for the large cost of handling, beyond which he must have his reasonable profit — a profit which, after this expense is met, offers a fair return on his investment.

Do you, as a contractor-dealer, ever consider what the stand-by service of a jobber means? Instead of bearing the burden on your own shoulders by way of investment in stock to make your own service continuous, he carries this for you. It represents from 5000 to 7000 different articles. It includes the production of a great many manufacturers. We can do this much cheaper for you in the end than for each one of you in turn to perform a service for yourselves. Have you through your purchasing agents recognized this fact? We must recognize that you in turn because of the necessity for an adequate net return must place your investment wisely, but in the end we feel that the price which you may pay us individually will be justified when the full recognition of the service which we offer is kept in mind.

We have no exclusive claim to the convention idea. We have listened with great profit to the treatment of problems in assemblies of contractor-dealers and light and power associations. We do feel, however, that the idea of personal contact has been carried to a further degree by the electrical jobbers, and with great profit—if the pleasure of doing business along fair, clean lines may be called profitable.

There is no doubt but you who represent the other classes of the industry are by the convention idea finding and expressing in clearer tones your problems, and in some instances finding the answers to them.

Again—what we most need is the co-ordination down the line. There is every indication that the organization heads are strongly in favor of the cordial

Those others gave their all—

BUY A LIBERTY BOND

re'ation. Has the message been earnestly given to those who go to make up your organization?

To meet at Del Monte for a discussion on mutual subjects may be useful, but fail utterly of the effect if the problem is not carried to all corners of our geographical section—to all cities, to all towns, and to all people associated. This is somebody's problem. Is it not yours? And if it is yours, should you not drive the question home to everybody?

There is also developing a movement of the Bolsheviki or I. W. W. type that requires close study. One offshoot of this movement lends encouragement to the attack on capital in general and public utilities in particular. I need hardly call attention to the heading on the first page of one of the dailies: "This Paper Is Committed to the Policy of Public Ownership of Public Utilities." This is but one symptom of the direction of movement. Another can be found if we but spend a few hours studying the system employed in one of our larger cities, which to our mind is destructive in nature, where the municipally owned vehicles seem to be placed to produce the deadly parallel. The handwriting on the wall seems plain to me—we have but to listen to the utterances of our representatives in Congress on the government control of railroads, to hear expounded theories which, if carried too far, will in our judgment be destructive of our national wealth, to say nothing of the effect on our industry.

If this danger was the sole motive for our closer relation, it would be enough.

What we need most is the development to a high degree of the community of interest among all men in our fraternity. The message seems plain to me. This will not be a matter of accident if it is brought about—rather one of earnest striving, intelligently and patiently directed. It is a great need. The movement was under way—prior to Riverside—but taking shape there, has been given further recognition at this Del Monte meeting.

There is a grave question whether it is the duty of the president or general manager to know and be able to address familiarly the clerks—the wiremen of the other branches—in fact it is not only impracticable, but impossible. But it can be established as a policy of the company that a man in the organization, other things being equal, has greatest value in the mind of the management when he shows this ability to make friends. It should not alone be his duty, but a pleasure. There never was a time when staunch friends are so needed by the lighting and power companies. Are you satisfied that your people understand this gospel? Have you encouraged them to establish a relation where they cordially call the dealer on the street as "Tom" or "Bill"? Let them be able to meet the contractor-dealer with conscience free from intended offense. Let the dealers promote the best feeling toward the central station. Let them forget for all time the criticism and bickerings. My personal observation is that this spirit is not lacking among the officials on any side, but somehow or other, the officials have not succeeded in getting the message to the subordinates, so that they in turn will enthusiastically assist the contractor-dealer in the problem of living, and therefore, the elimination of killing practices—for instance, wiring at cost, the selling of goods at cost, or other practices which are generally recognized as unethical.

Let me anticipate the boomerang coming my way by saying that the jobber is by no means perfect—far from that—he is struggling in the meshes of his own infirmities—many practices now in effect should be abandoned. Our disposition is to do this—so when we offend, deal out the criticism and give us the help to correct the offense.

It would be most unfortunate if this movement should be misinterpreted as an informal combination to restrain operations of any kind—far from it—we should let it be known that we seek nothing by way of favor except that which our legitimate striving along efficient lines will earn for us.

The practical end to all this has arrived when the community of interest in each city, town and hamlet is developed, where our questions are sympathetically discussed by all branches of the industry, and speedy conclusions are arrived at, resulting in unified action; all in accordance with the principles of law and order. This spirit of co-ordination will be developed greater in some localities than others. The ideal will have arrived when the Golden Rule is practiced in our relations—do unto others as we would have them do unto us. The development of this happy condition of affairs is difficult, but its attainment is possible—never will it be accomplished without great toil, untiring patience and thankless effort. As it is fruitful of good for all—not the least the general public—it is worth while. We will all greatly benefit by it. For those most dependent on the popular opinion it will furnish a flywheel effect—carrying over the valleys of criticisms (these come no matter how undeserved). For the man whose business is to sell—he is not seriously concerned as to the attitude in this branch of the industry—so his mind is free to devote his entire energy to his own problems.

POWER ON THE FARM

There is an old proverb that "the mill will never grind with the water that has passed," but, according to the Farm Journal, here is an instance in which the water was given a new chute and the mill is now doing more than it ever did in a very long history. The mill had been abandoned, but by the use of cement it was given a new race and its wheel connected with an electric generator. It is now furnishing the current with which to illuminate a whole farm; and by making use of a portable motor and extension wires, machinery at different points on the farm and in the home could be given abundant power. Washing machine, churn, sewing machine, vacuum cleaner, etc., could thus be easily operated, much to the delight of the housewife. Water could be pumped, wood sawed, feed ground, silage cut, etc.; perhaps some extra power could be sold to the neighbors.

Germany doubts our sincerity—

BUY A LIBERTY BOND

WHAT WESTERN INVENTORS ARE DOING

BY WM. K. WHITE AND H. G. PROST

(There is no better investment than a good patent—but an investor should be sure of two things: He should know the commercial value of the article patented, and he should make sure that the patent itself covers his rights. A loosely drawn application whose claims do not cover the whole situation, would have little worth, for it might allow competitors to utilize the very element, perhaps, which makes for commercial success. The authors of this interesting article are prominent patent attorneys of San Francisco. —The Editor.)

THE PATENT SYSTEM

In view of the large number of patents being issued annually, it is to be expected that a large proportion of them cover inventions of no great value. Of course, the value of a patent depends primarily upon the value of the invention disclosed. The issuance of a patent does not increase the intrinsic value of an invention. The fact, therefore, that many patents are of no value, because the inventions respectively covered by them are practically worthless, should not influence one to consider all patents poor investments.

There is no form of investment that yields a larger return than a broad patent on an invention that supplies a general public want or need. Furthermore, the monopoly granted by such a patent is given ample protection by the courts. Nine times out of ten, the man who complains about the lack of protection given patent rights, is the owner of a patent having no value by reason of not disclosing an invention having any value or by reason of being based on an application improperly and unskilfully prepared.

Before investing in a patent, one should obtain expert advice; first, in respect to the intrinsic value of the invention disclosed, and, second, in respect to the value of the patent claims as a grant of a monopoly of the whole invention. As stated before, a patent may disclose a valuable invention, but not properly or completely claim it; and the scope of the monopoly, granted by the patent, depends primarily upon the claims of the patent and not upon what is disclosed in the drawings or is described in the specification of the patent.

Furthermore, it is the commercial value of the invention that should be investigated. A patent may cover a wave-motor which operates successfully, but, nevertheless, is a commercial failure due to the fact that power can be generated more cheaply by the use of oil or coal. It is estimated that the new steam plant of the Buffalo General Electric Company at Tonowanda, N. Y., will generate electricity from coal more cheaply than can be done from the waters of Niagara Falls.

The importance of maintaining a patent system which affords the inventor ample protection and which, in fact, does "add the fuel of self-interest to the fire of genius," was well expressed by Mr. Edmund Wetmore of New York in his address before a recent meeting of the American Bar Association. Mr. Wetmore closed his address with the following remarks:

"The fact that patent laws are primarily for the benefit of the public and not to make inventors a favored class is not as widely understood as it should be. Patents are granted to encourage the making of inventions and to insure their finally becoming public property instead of remaining secrets or being lost or forgotten. And this can only be accomplished by an efficient patent law. This was admirably shown by Mr. Fish in his paper read at the last meeting of the association, in which the point was strikingly illustrated by the instances of those countries that had reinstated their patent laws after the experiments of abolishing them. A study of facts and statistics will show that patented inventions lie at the bottom of the conveniences, the comforts and the opportunities of our present mode of life, and without which our civilization would cease to advance. Appealing to considerations that come home to all, the influence of patented inventions tends directly to bring down the cost of living in the three essential particulars of rent, food and clothing. As to rent and food, because of the vast extension which patented inventions have produced in the facilities for transportation, whereby not only are the regions which constitute the suburbs of our great cities brought within easy reach of the centers of trade and the source of employment, but long distance transportation, particularly as to food products, opens up the regions where there may be a surplus to those in which there is a deficiency; and as to the matter of clothing, the numerous and accumulated inventions relating to the machinery employed in the production of clothes tend to bring the price of actual necessary clothing down to the lowest figure.

"Examples of the public benefit derived from patented inventions, familiar enough to those who have studied the subject, might be multiplied indefinitely for the purpose of bringing that fact home to those who have not given it sufficient consideration, and as to the enormous results which follow from inventions originally protected by patents, a more striking instance cannot be found than that shown in the present gigantic war. There are three inventions which in a large measure control the conflict and have changed the whole art and strategy of war, namely, the aeroplane, invented and patented by the Wrights; the automobile, covered by numerous patents; the wireless telegraph of Marconi—not to speak of the inventions relating to artillery, heavy and light, to the machine gun and to the rifle, some of which have been kept as government secrets, but the majority of which have been patented in the country of their origin.

If you don't vote you help to elect the other fellow.

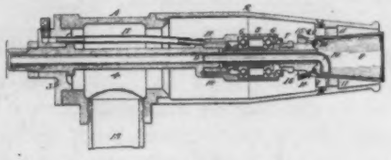
BUY A LIBERTY BOND

"These, as it seems to me, are some of the topics by which a public feeling may be aroused that must in the end check ill-considered legislation directed against our patent system, and which, if unchecked, would gradually destroy it by piecemeal."

WESTERN INVENTIONS

Centrifugal Oil Burner

Patent No. 1,255,592, issued to Milton A. Fesler, of San Francisco, California, discloses a novel form of oil burner. The burner consists of a horizontal cylindrical casing having arranged in one end thereof a horizontal rotating cup into which the fuel oil is fed through a central pipe. The edge of the cup is spaced from the casing, so that an annular



passage is formed between the cup and the casing. The oil is discharged radially from the edge of the cup and passes over the annular passage where it encounters and is mixed with a discharging stream of air caused by blower vanes on the outer face of the cup within the casing. To prevent a whirling movement of the air discharging through the annular passage, a series of fixed direction blades are formed on the inner face of the casing adjacent the discharge end and the air from the blower passes these blades before it is discharged.

Insulated Testing-Plug Terminal

Patent No. 1,255,824, issued to Milton H. Shoenberg of San Francisco, and Frank Talcott of Burlingame, California, and assigned to the Majestic Electric Development Company, shows a new form of plug terminal. The terminal consists of a body of insulating material having a longitudinal bore

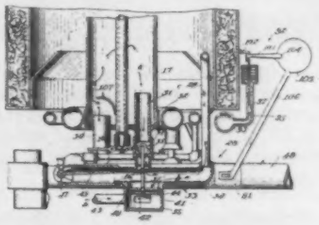
therein enlarged at one end to form a recess. The contact member is arranged in the recess and projects beyond the end thereof and is provided with an integral spindle which extends through the bore and is connected to the conducting wire. Surrounding the contact member and fitted within the recess is an insulating sleeve and within the recess and bearing against the end of the sleeve is a spring which normally presses the sleeve outward so that its outer end projects beyond the end of the contact member. When the plug is pushed into engagement with the contact clips in the socket, the sleeve is pressed back to bare the contact member.

Process of Producing Iron and Steel

Patent No. 1,255,191 has been issued to Samuel McDonald, of Alhambra, California, for a process of producing iron and steel. This process consists in providing a molten body of iron ore on top of a molten charge of iron or steel and blowing a gas containing a reducing agent downwardly against the molten iron ore so that portions of the ore are carried below the surface of the charge of molten iron or steel and are thereby reduced to iron or steel. The gas employed is a non-oxidizing gas mixed with powdered carbonaceous material.

Water Heater

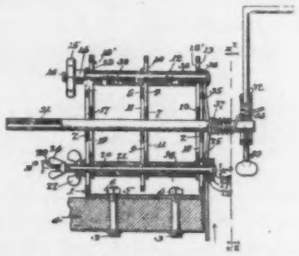
Patent No. 1,255,835, issued to Hugh G. Shaug, of Los Angeles, California, shows a new form of gas water heater. The heater is provided with primary and secondary burners, the primary burner being arranged to maintain the water in the heater at a constant temperature when water is not being used, and the secondary burner being of larger heating capacity and being arranged to be thrown into operation when water is being used. A water circulating system is disposed in the path of travel of the heat from the burners and means



are provided for maintaining the circulation of the water in one direction when the primary heater is in operation and for interrupting and reversing the direction of flow when the secondary burner is in operation and the degree of heat is increased.

Coil Forming Machine

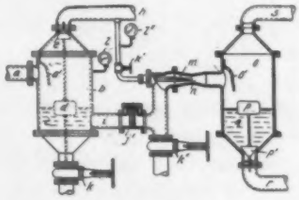
Patent No. 1,253,782, issued to Edgar J. Bryan of Riverside, California, shows a coil winding machine of new construction. The machine consists of a frame provided with



slidably adjustable bearing plates through which the arbor extends. The arbor is removable and longitudinally slidable in said bearing plates, and is provided with a handle for rotating it.

Process and Apparatus for Separation of Oils and Gases

Patent No. 1,255,018, issued to Philip Jones, of Santa Maria, California, discloses a process for separating gas from oil and also an apparatus with which the process may be practiced. The oil as it flows from the well contains gas which it is the object of this invention to remove and conserve. The oil is flowed under pressure into a closed tank which is of sufficient



size to reduce the velocity of the flowing mixture to such a point, so that the oil will settle. The oil is then passed out from the tank through a venturi tube and a portion of the separated gas passes from the tank through a nozzle arranged in the venturi tube, which causes the venturi to act as an injector, placing the oil under pressure in a second tank. In the first tank, the rate of outflow of the gas is determined by the level of the oil in the tank, so that the gas is maintained under pressure during the separation.

We stand for justice—

BUY A LIBERTY BOND

SPARKS—Current Facts, Figures and Fancy

(Necessity being the mother of invention, the present world situation is bound to give rise to a horde of new ideas. Among those recently suggested to solve the problems of the war are the floating power plant and the "audible" glasses for the blind, presented below. A new substitute for celluloid and a new use for electric lights to save money in fish food are further recent experiments which promise new development along very different lines. Other odds and ends of electrical interest are also included in the digest.—The Editor.)

A non-combustible substitute for celluloid has been invented by a professor in a Japanese university, and is said to furnish satisfactory material for tiles, buttons and insulators. While not perfectly fireproof, the substance requires considerable heat to kindle, and burns very slowly.

* * *

Most of us felt a real spirit of daring when attacking our first whale steak, but whale meat has been used for hundreds of years in Japan. In the earliest books of Japanese history there are accounts of the capture of whales with nets and the ceremonies and feasting which followed a successful hunt.

* * *

A description of the living quarters of the American troops in some of the captured trenches of France pictures them in an old limestone quarry seventy-two feet underground. Fresh air is supplied by large air pumps. The cave is in part electrically lighted and provides excellent accommodations for our men.

* * *

It is only in America that they say "hello" over the telephone, but the word itself comes from foreign sources. According to one authority, it comes from the word "holler" with a Norse origin. Another credits it to the French hunting call, "Au loup!" (to the wolf) which was corrupted to "halloo" by the English and later to the "hello" with which we greet our telephone calls.

* * *

The way they do it in Russia is to confiscate your business if you have trouble with your help—(and who does not?): One electric lighting company has been taken over recently by the Bolsheviki to prevent its being closed down. The decree requires that all the employees, including the technical staff, shall remain at their posts and continue their work. For unauthorized absence from duty, or sabotage, the guilty will be brought before the revolutionary courts.

* * *

A central duplicating bureau which issues thousands upon thousands of circulars, letters and pamphlets each day, is a feature of the Southern Pacific general office system. Mimeograph machines, electrically driven multigraphs, an automatic addressograph and machines for shaving used dictaphone cylinders so that they may be used again, are only a few of the types of electrical instruments which make the work of this department possible.

* * *

The use of an electric light to catch fish is no new idea, but to feed them——! A Kansas state hatchery has installed electric lights above the fish ponds, with the result that large numbers of bugs and smaller insects are attracted to the vicinity at night. Eventually many of these fall into the water and are fed upon by the fish. In the past the cost of food for the finny creatures has been about $1000 a year, but it is predicted that under the present arrangement this expense will be reduced.

* * *

A novel suggestion for an electrically driven bevy of ships which will carry a floating power plant with them comes from London. The suggestion is to have one set of detachable power producing machinery for three or more hulls, which would each be equipped with propellers and electric driving motors only, arranged for coupling by cables to the power plant. The power plant is apparently housed in a detachable and floatable poop, which can be continuously employed in propelling one or the other of the hulls, and can, in times of stress, be separated from the hull.

* * *

The advent of electricity in China, together with the increased transportation facilities and industrial developments, has brought the usual accompaniments of unavoidable accidents and sectional transfer of disease. In consequence, a study of human physiology is being permitted now which was absolutely forbidden before. Up to comparatively recent times the belief prevalent in both China and Japan was that the people of the West were made differently from those in the East. At least one Oriental text book on medicine shows a picture of the interior of the human body that has the various organs divided in much the manner of a modern office building with the elevator shaft as the connecting medium.

* * *

An instrument to enable the blind to "hear" light has been suggested by a French paper. The light detector would consist of a thermo-couple placed at the focus of a lens or parabolic reflector. The receiver would be a special type of telephone receiver consisting of a coil through which passes current from the thermo-couples, and a soft iron diaphragm traversed by intermittent current from a small Rumkorff coil. The intensity of the note emitted when light falls upon the thermo-couples of the eyepieces should make it easy to determine the direction of the sun or of a lamp or window.

There is more reason to support a republic than a despotism.

BUY A LIBERTY BOND

PERSONALS

C. E. Grunsky, consulting engineer of San Francisco, has just returned from the national capital, where he has been for the past eight weeks representing the interests of the Imperial Valley of Southern California in its plea for new legislation affecting the diverting of water from the Colorado River to the Imperial Valley. On his return from the East, Mr. Grunsky attended a conference of noted reclamation engineers at Yuma, Arizona, composed of national and state authorities, looking toward an early solution of many of the perplexing problems in the Southwest. Three bills are now before Congress, one of which touches upon the power situation along the Colorado River. The passage of these bills will do much to alleviate the rather trying conditions through which these great reclaimed areas have been passing.

George H. Curtiss has resigned as salesman with the Pacific States Electric Company at San Francisco.

M. L. Joslyn, of Chicago, president of Baker-Joslyn Company, is spending a few weeks on the Pacific Coast.

John B. Matthews has become affiliated with the Moore and Scott Iron Works, Oakland, Cal., in the capacity of engineer.

Lewis E. Marsh, manager of the Specialty Shop for inventors at San Francisco, was recently married to Miss Violet E. Mills.

C. G. A. Baker, of San Francisco, vice-president of Baker-Joslyn Company, is at the Seattle branch of his company on business.

John W. Morton, formerly with the distribution department of the Pacific Gas & Electric Company, is now with the Union Iron Works.

Fred Wilkie, for the past three years assistant state engineer of Idaho, has been appointed state engineer, succeeding J. H. Smith, resigned.

F. M. Bernardin of the B. R. Electric Company, Kansas City, has been at Del Monte for some time and is to extend his visit for some days longer.

Second Lieutenant C. P. Taylor, formerly with the Pacific Gas & Electric Company, is at present on duty in the General Engineer Depot in Washington.

C. L. Cory, professor of electrical engineering at the University of California, is engaged in research work for the government looking toward the fixation of atmospheric nitrogen.

W. M. Deming, general manager of the Technical Publishing Company, publishers of the Journal of Electricity, has returned to San Francisco after five weeks absence in the East.

John L. Radenbaugh, formerly in the installation department of the Pacific Telephone & Telegraph Company at Seattle, has been appointed manager and wire chief at Heppner, Oregon.

Daniel W. Mead, professor of hydraulics and sanitary engineering at the University of Wisconsin, and a well-known authority on water supply investigations, is a recent San Francisco visitor.

H. H. Lyons, superintendent of the Ordway (Colo.) division of the Arkansas Valley Railway, Light & Power Company, has been appointed local organizer for the sale of Thrift and War Stamps.

Lieutenant Hale, formerly connected with the Pacific Gas & Electric Company offices at San Jose, who was last reported at Vancouver, is now located at Fort Meyer with the 37th Engineers.

H. L. Fitch, toll traffic chief of the Pacific Telephone & Telegraph Company, San Francisco, left March 10th to take up new duties with the American Telephone and Telegraph Company in New York.

H. H. Jones, manager of the San Diego Consolidated Gas & Electric Company, San Diego, Cal., has been appointed chairman of the finance committe of the San Diego branch of the American Red Cross.

C. G. Hyde, professor of civil engineering at the University of California, is prominent on the list of those of the faculty doing war service, as the designer of fifteen miles of sewer system for Camp Fremont.

G. A. Kyle, of the engineering staff of the Siems-Carey Railway & Canal Company of China, operated by the American International Corporation, is a former Portland man recently captured by Chinese bandits.

W. W. Lowe of the Electric Appliance Company, Chicago, and his wife and daughter, have been spending some time on the coast. They have been visiting at Del Monte and are returning now, via Portland, to Chicago.

Henry A. MacNamara, former manager of the Pacific Telephone & Telegraph Company at Hollister, has been detached from an infantry regiment at Camp Lewis and sent to Washington for service in the signal branch of the army.

J. W. Redpath, secretary of the California Association of Electrical Contractors and Dealers, has returned from Southern California, where he has been engaged in helpful personal work for the association during the past three weeks.

Hugh Trainer, for many years connected with the East Las Vegas, N. M., office of the Mountain States Telephone and Telegraph Company, has been appointed to the position of manager of the company's exchange at Alamosa, Colo.

Al Youngholm, credit man for the Electric Railway & Manufacturers Supply Company of San Francisco, has severed his connection with the company to become secretary and manager of the Apex Manufacturing Company in Oakland, Cal.

Edward Whaley, formerly secretary and general agent of the Northern California Power Company, was made general manager at the recent annual meeting of the company. **W. H. Pearce,** former assistant secretary, was promoted to the position of secretary.

D. J. Butts, Los Angeles manager of the Western Electric Company, has recently brought out new ideals in practical co-operative effort among manufacturer, jobber, central station, and contractor-dealer. At the launching of the Electrical Co-operative Campaign in Los Angeles on the evening of March 15, 1918, Mr. Butts showed how every element must harmonize with the whole, or, like the stubborn ass athwart a beautiful California highway, the traffic of a commonwealth may be interfered with by one single unit. His forceful remarks are printed in full elsewhere in this issue of the Journal of Electricity.

It is only a temporary self-denial.

BUY A LIBERTY BOND

Professor C. E. Lucke, formerly chief of the mechanical department of Columbia University, now a member of the aviation corps, accompanied by an aide, Lieutenant R. D. Kirkpatrick, has been spending some days in San Francisco.

R. H. Husbands, formerly Los Angeles manager for Pierson-Roeding & Co., who has retired from the selling agent field, has been put in charge of high tension insulator sales for the Pacific States Electric Company at Los Angeles.

F. E. Pernot, assistant professor of electrical engineering at the University of California, has taken a leave of absence from the university in order to assist the government at Washington in certain radio work for the aviation service.

Officers of the 405th Tel. Batt., Signal Corps, N. A., Camp Lewis, Wash. (from left to right): 1. First Lieut. E. M. Brown, Co. E, Emp. Tel. Dept., Santa Fe Ry., Newton, Kansas. 2. First Lieut. Wm. E. Liggett, Batt. Adjt., Emp. Mountain States Tel. & Tel. Co., Denver, Colorado. 3. Captain Edward W. Sloan, Commanding Co. E, Emp. Western Union Tel. Co., Minneapolis, Minnesota. 4. Major John A. Kick, Commanding Batt. Emp. Western Electric Co., New York City, N. Y. 5. Captain Alex. W. Young, Commanding Co. D, Emp. Mountain States Tel. & Tel. Co., Denver, Colorado. 6. First Lieut. Edgar C. Fisher, Co. E, Emp. Western Union Tel. Co., San Francisco, California. 7. First Lieut. E. R. Hannibal, Co. D, Emp. Mountain States Tel. & Tel. Co., Denver, Colorado. 8. First Lieut. C. F. Kunsemiller, Batt. Sup. Officer, Emp. Mountain States Tel. & Tel. Co., Denver, Colorado.

George A. Damon, a consulting engineer of Los Angeles, and local representative of Bion Arnold, is doing splendid work in Southern California looking toward encouraging engineers generally in undertaking helpful civic work in these days of national emergency.

F. J. MacGougan, general commercial superintendent of the British Columbia Telephone Company, and **F. L. McNally,** district commercial superintendent at Seattle, were recent visitors at Spokane, attending the fifteenth district conference of the Rotary Clubs of America.

G. E. McFarland was re-elected president of the board of directors of the Pacific Telephone and Telegraph Company at their annual meeting, held in March. Vice-presidents are **H. D. Pillsbury** and **J. M. Quay;** secretary and treasurer, **F. W. Eaton;** general manager, **J. C. Nowell;** general auditor, **F. C. Phelps.**

M. P. Macmillan, manager of the Reno exchange of the Pacific Telephone & Telegraph Company, has been appointed a member of the Nevada State Fish and Game Commission by Governor Boyle. This is a decided compliment to Mr. Macmillan's good citizenship and popularity in the state of his residence.

O. C. Merrill, chief engineer of the Forestry Bureau at Washington, who was for years a resident engineer of the Forestry Service at San Francisco, is taking a very important part in formulating new water power legislation at the national capital, comment on which may be found on the editorial page of this issue.

George J. Walton, local manager of the California-Oregon Power Company at Klamath Falls, has charge of the work there on the military map which the company is making of southern Oregon and northern California. The company in this case is not only mapping its own projects but acting as an agent for the government.

Paul M. Lincoln, commercial engineer for the Westinghouse Electric & Manufacturing Company, and a past president of the American Institute of Electrical Engineers, is a recent Pacific Coast visitor. At Los Angeles Mr. Lincoln was an interested attendant at the large get-together banquet on March 15, 1918, described elsewhere in this issue.

C. B. Hall, general manager of the Illinois Electric Company at Los Angeles, and **Miles Steel,** Pacific Coast manager of the Benjamin Electric Manufacturing Company, with headquarters at San Francisco, have returned from a several weeks sojourn in the Hawaiian Islands. The skies proved brilliantly alluring, the flying fish entrancing, the volcano at Kilauea inspiring, and so Mr. Steel—— [deleted by the censor].

Harry W. Alexander, director of publicity, The Society for Electrical Development, New York, has resigned to become assistant to president on sales, American Writing Paper Company, New York and Holyoke, Mass. Mr. Alexander is succeeded by **Roy B. Woolley,** now in the society's publicity and sales department, but late of the American Ambulance Field Service, Verdun sector, France. Mr. Woolley was formerly sales manager, Standard Electric Stove Company, of Toledo.

D. E. Harris, vice-president of the Pacific States Electric Company; **L. H. Newbert,** manager of the commercial department of the Pacific Gas & Electric Company; **Albert H. Elliot,** secretary of the Pacific Coast Electric Supply Jobbers Association; **Robert Sibley,** editor of the Journal of Electricity; and **J. W. Redpath,** secretary of the California Association of Electrical Contractors and Dealers, attended the splendid gathering for bettering co-operative helpfulness among men of the electrical industry, held at Christopher's, in Los Angeles, March 15, 1918.

Chester Pennoyer, formerly manager of the San Francisco office of the National Conduit & Cable Company, has

gone East to become general sales manager for the company. **James E. Crilly** of Holabird Electric Company at San Francisco, has been made San Francisco manager of the National Conduit Company.

Show that you believe in the President's last message.

BUY A LIBERTY BOND

Garnet Young of Garnet Young & Company, San Francisco, was in Portland recently.

George Oates has resigned from the district managership of the Utah Power & Light Company at Rexburg, Idaho.

T. E. Bibbins, president of the Pacific States Electric Company, was in Portland recently and is spending two weeks in the Northwest.

R. B. Wiseman, proprietor of the Electric Supply and Fixture Company, Ellensburg, Washington, spent several days as a recent Seattle visitor.

Carl A. Wolfrom has been promoted from assisting operating manager to district manager for the Utah Power & Light Company at Rexburg, Idaho.

Thomas McCauley, general superintendent and electrical engineer of the municipal government of Calgary, Alberta, was a Seattle visitor some time ago.

Walter D. Sultan, formerly with the rate department of the Pacific Gas & Electric Company in San Francisco, has been made a captain in the Aviation Service.

Joe E. King has been transferred from the post of local superintendent for the Southern Sierras Power Company at Corona, Cal., to a similar position at San Bernardino.

Walter Cary, vice-president of the Westinghouse Electric & Manufacturing Company, and vice-president in charge of the Westinghouse Lamp Company, was in San Francisco recently.

W. S. Berry, sales manager for the Western Electric Company on the Pacific Coast, headquarters, San Francisco, was in Portland recently while making a trip through the Northwest.

H. D. Stephens, manager of the generator section, power department, Westinghouse Electric & Manufacturing Company, East Pittsburgh, visited Seattle and other Pacific Coast centers in the interest of company business, recently.

Burton R. Stare of Burton R. Stare Company, dealers in electrical apparatus and specialties, Seattle, recently returned from a three weeks business trip to the East, during which time he visited Chicago, Milwaukee, Cleveland, New York and St. Louis.

James B. Black, formerly assistant general agent of the Great Western Power Company at San Francisco, has taken over the duties formerly discharged by W. W. Briggs, resigned, and has been given the title of general sales manager of the Great Western System.

S. V. Wellman of the Wellman, Seavor, Morgan Company, Cleveland, Ohio; **W. B. Hall** of Pass & Seymour Co., Solvay, New York; **H. J. Armstrong** of the Smith-Booth Usher Company, Los Angeles, Cal., and **Foster C. Gibson** of the Edison Storage Battery Supply Company, of Seattle, Wash., were recently in San Francisco and attended the luncheon given by the San Francisco Development League in honor of Samuel Insull.

S. E. Hutton, for several years head of the mechanical and electrical engineering departments at the University of Idaho, recently enlisted in the United States army at Spokane, Wash., as a private in the aviation section of the Signal Corps. Mr. Hutton was formerly consulting engineer of the Idaho State Public Utilities Commission and on the faculties of Highland Park College at Des Moines, Iowa, and the University of Kansas.

Samuel Insull, president of the Commonwealth Edison Company of Chicago, the largest producer of electricity in the United States, is a recent San Francisco visitor. A notable gathering in honor of Mr. Insull was held on March 27, 1918, at the Palace Hotel, with the San Francisco Electrical Development League as hosts and members of the National Electric Light Association and the American Institute of Electrical Engineers as guests.

John H. Lewis, state engineer of Oregon, has gone to Washington, D. C., to urge the immediate execution of the state's contract with the United States so that construction work may commence immediately on the 46,000-acre Jordan Valley Carey act project. He will also take up with the department a number of other questions affecting Central Oregon irrigation projects, which have been long delayed, such as the issuance of patents on the Central Oregon and Tumalo projects.

J. Harry Sroufe, of the Jaggar-Sroufe Company of Portland, was unanimously elected president of the Portland Association of Electrical Contractors and Dealers at their last meeting, Allen S. Halls having resigned. Mr. Sroufe has during his entire period in Oregon been an active worker in the association affairs, and his election as president comes as a reward of his earnest and conscientious efforts along the association line, and the electrical fraternity of Portland are glad and indeed fortunate to have, as the head of their organization, so capable and worthy a gentleman.

OBITUARY

E. K. Patten, western manager for the Bryant Electric Company, with headquarters in Chicago, died at his home in Chicago, Sunday, March 24, 1918.

Charles H. Williams, who was well known among Western public utility operators, died in Denver, Colorado, on March 10th, of pneumonia. He was 44 years of age. For the last half dozen years Mr. Williams had been engaged in building and operating gas and electric plants in many of the smaller cities of the West.

Carlton H. Parker, professor of commerce at the University of Washington, died of pneumonia in Seattle on March 16, 1918. Mr. Parker was well-known among men of the electrical industry up and down the Pacific Coast, due to his helpful work in settlement of industrial disputes, especially among I. W. W. agitators. A widow, three young children, and a host of friends bemoan his loss.

C. B. Lamont, one of the West's foremost structural engineers and inventors, died in Seattle recently of pneumonia, at the age of 41 years. For many years he was assistant to the president of the Seattle Construction and Drydock Company. His first commercial connection after being graduated from Cornell University was with the Union Iron Works of San Francisco. He superintended many engineering enterprises in Seattle, Portland and Spokane, and for several years was consulting engineer for the White Pass & Yukon railroad.

Joseph D. Quay, vice-president of the Pacific Telephone and Telegraph Company, died in his room at the Pacific Union Club recently, after fifty years of winning many friends in San Francisco and losing none. He would have been 82 years old on March 27. Quay came to California from Hudson, Ohio, his birthplace, in the sixties. He was employed by the old publishing firm of Roman & Co., for a few years, and then entered the stock exchange in the bonanza days. In 1870 Mr. Quay became assistant secretary of the old Union Club, serving in that capacity for ten years. Formerly Mr. Quay was a director of the Spring Valley Water Company and other corporations.

Errata: In the article of L. R. Jorgensen on Advances in Multiple Arch Design, appearing in the Journal of Electricity, March 15, 1918, the two following typographical errors should be noted: Cross out the word "not" in the eighth line from the bottom of page 286, first column. Substitute "larger" for the word "smaller" in the third line, page 287, first column.

Would you be willing to advertise that you did not buy a bond?

BUY A LIBERTY BOND

MEETING NOTICES FOR ELECTRICAL MEN

(A joint meeting of the Engineering Societies of the San Francisco Bay region in honor of Professor Swain, at which some three hundred members were present, was one of the many important gatherings of the last two weeks. Interesting plans are reported from the Nevada Section, A. I. E. E. An epoch-making dinner which served to launch the California Co-operative Electrical Campaign in Los Angeles is reported elsewhere in the Journal. Particular note should be made of the change of dates of the coming Del Monte Convention from April 24th-27th to May 9th-11th.—The Editor.)

Joint Engineering Banquet in San Francisco

Three hundred distinguished engineers representing the five national engineering organizations dined at the Palace Hotel on the evening of March 20, 1918, in honor of George F. Swain, the noted engineer who gave the Hitchcock lectures at the semi-centennial celebration of the University of California, as announced in the Journal of Electricity, March 15, 1918. President Benjamin Ide Wheeler of the State University was first introduced by Robert Sibley, editor of the Journal of Electricity and chairman of the committee of arrangements. Then followed other intensely interesting speeches by Paul Downing, chief engineer of the Pacific Gas & Electric Company, on "Interconnection of Power Plants"; "Fuel Oil Saving" was discussed by David M. Folsom, Pacific Coast Fuel Oil Administrator; "War Problems of Public Utilities," by Max Thelen, president of the California Railroad Commission; and "National Issues of Today" by George F. Swain, professor of civil engineering at Harvard University and the Massachusetts Institute of Technology.

C. D. Marx, acting president of Stanford University and a past president of the American Society of Civil Engineers, fittingly introduced the latter speakers.

The general theme that ran through the various discussions was of a highly patriotic character, and those attending went away with a distinct feeling of patriotic fervor which led each to make a new resolve to be of better and higher service in assisting the national government in meeting the present day emergencies.

BUILDERS OF THE WEST—XXVI

S. M. KENNEDY

When we inspect the workings of some giant man-of-war or some physical structure that may perchance adorn a great city, it is a comparatively easy matter to properly pay homage to the builder. But for the man who builds a giant machinery whereby the marketing of unseen electric energies may be efficiently brought about, it is difficult indeed to properly appraise the high value of service rendered. It is, as a consequence, with unusual deference and affection that this issue of the Journal of Electricity is dedicated to S. M. Kennedy, general agent of the Southern California Edison Company, for he has built an enduring monument in the great Southwest that not alone efficiently markets the product of his company, but with it all a monument that constantly points to a truer and more effective ideal of citizenship.

Nevada Section, N. E. L. A.

A meeting was held in Reno, March 11, 1918, and arrangements made to hold a session of the Nevada Section of the National Electric Light Association, at Reno, April 13, 1918. F. O. Broili was appointed chairman of the Program Committee.

It is earnestly requested that the different members of the committee extend a pressing invitation to all engineers and others interested in the electrical and mechanical industry to attend this meeting.

The Engineers' Club of the University of Nevada are joining in to help make the meeting a success. Many members of the committee have attended affairs where the Engineers' Club have been hosts and know that they always are able to get up something worth while.

The members are also requested to prepare an article, be it ever so short, on some subject which they think appropriate.

Several things have been proposed in the way of "Safety First," to be brought to the attention of the electrical fraternity at this meeting. This part of the program will be handled by Mr. George Smith, chairman of the Industrial Insurance Commission, assisted by Professor C. R. Hill of the University of Nevada.

Los Angeles Jovian Electric League

The Los Angeles Jovian Electric League meeting for March 13, 1918, which initiated its meetings at the American Cafe, proved unusually interesting. P. C. Ensley, of Graham-Reynolds, as chairman of the day, proved himself an able executive. Seward A. Simons, an attorney of Los Angeles, spoke on "The Bright Side of the War," and roused his hearers to a high state of optimism and patriotic fervor. The convention committee of the Pacific Coast Section, N. E. L. A., attended the meeting in a body, among them being R. H. Ballard, A. B. West, E. R. Northmore, W. L. Frost, J. W. Redpath, W. M. Deming and Robert Sibley.

Under the able presidency of H. N. Sessions, of the commercial department of the Southern California Edison Company, the Los Angeles League is going ahead by leaps and bounds, and it is believed the meetings will prove a helpful factor in helping to solve the problems of the industry during coming months.

San Francisco Electrical Development League

On March 13, 1918, Professor B. M. Woods of the University of California, who is dean of the federal aviation school at the university, gave a very inspiring talk on the history and present progress of the art of flying.

Dr. Charles Cestre of the University of Bordeaux, France, and delegate of the French government to the University of California centenary, spoke at the meeting of March 20, 1918, on the "Economic Phases of the War." Robert Lloyd, leader of the chorus music at Camp Lewis, aroused the audience, which was a large and enthusiastic one, to a high pitch of patriotism by getting the entire number present to sing several of the camp songs, which were learned impromptu in two or three minutes time under his able leadership.

"Our boys" are no more responsible for this war than are you.

BUY A LIBERTY BOND

The meeting of the League of March 27, 1918, was held in honor of Samuel Insull, president of the Commonwealth Edison Company of Chicago. As Mr. Insull is a national figure in utility life his remarks on public questions of the day relating to utility life were listened to with unusual interest. The meeting was held in the Ball Room of the Palace Hotel and proved to be the largest gathering of the current year.

Program for Annual Convention of Northwest Electric Light and Power Association, to Be Held in Portland, September 11, 12, 13 and 14, 1918

Wednesday morning, September 11—General meeting.

Wednesday afternoon—Report of Public Policy Committee and paper to be announced later.

Thursday, September 12, and Friday morning, September 13—Paper and general discussion on emergency and war problems, along the following lines:

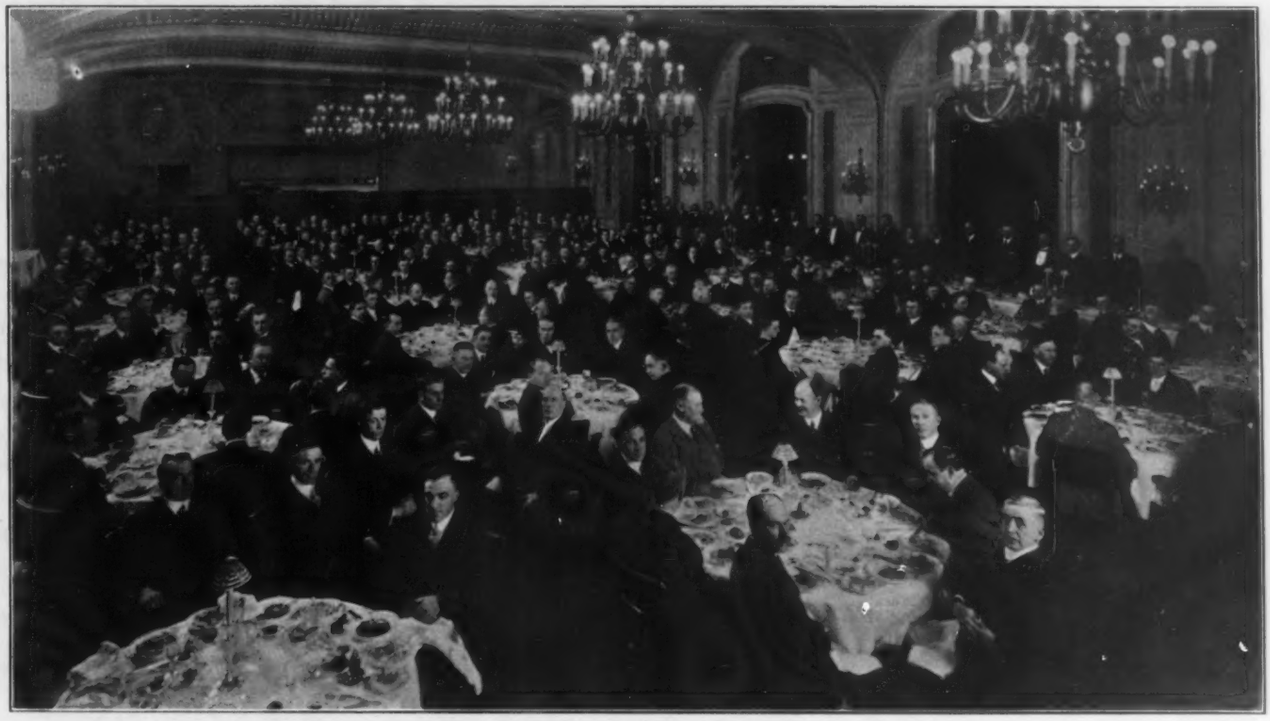
(a) Financing. Author to be announced later.
(b) Extensions: Costs; Justifications for; Method of Financing. Messrs. Stacey Hamilton, L. A. Lewis and C. R. Young.
(c) Service Contracts: Value and Importance of Saving Clauses, Etc. By Robert W. Clark.
(d) Diversifying Customers' Loads. By J. R. King.
(e) Limitation of New Business Activities During War. By W. H. Lines, G. C. Sawyer and Mr. Boykin.
(f) Interconnection of Systems and Elimination of Duplication. By Messrs. Merwin, Quinan and Greisser.
(g) Stores and Purchasing Problems: By Mr. Shenkle.

Friday afternoon will be devoted to the report of the Electric Range Committee.

The above statement covers only the program and does not take into consideration the details of entertainment which will be announced later.

National Association of Electrical Contractors and Dealers

The National Association of Electrical Contractors and Dealers has permanently established their headquarters at 110 West Fortieth street, New York City, Room 1703, dating from March 20th.



A MAGNIFICENT JOINT BANQUET OF FIVE NATIONAL ENGINEERING SOCIETIES

Here is the most brilliant gathering of engineering talent in the West during the current year. The occasion is a dinner given to George Fillmore Swain, the noted engineer and teacher from the East, who gave the Hitchcock lectures at the semi-centennial celebration of the University of California. The banquet took place at the Palace Hotel in San Francisco, March 20, 1918. Standing at the speaker's table, from left to right, are:

Chas. H. Delany, steam power specialist, Pacific Gas & Electric Company, Secretary of the San Francisco Section, A. S. M. E.
R. A. Thompson, engineer for the Interstate Commerce Commission.
Andrew Lawson, professor of geology, University of California.
Bryant Drake, chemical engineer, Union Iron Works, secretary San Francisco Section, A. C. S.
Frank H. Probert, dean of the College of Mining, University of California.
L. D. Ricketts, consulting mining engineer and past president, A. I. M. E.
George W. Dickie, noted naval architect, formerly with Union Iron Works.
Paul Downing, chief engineer electric generation, Pacific Gas and Electric Company.
C. D. Marx, acting president Stanford University, past president A. S. C. E., and toastmaster of the evening.
Allen Jones, engineering staff, General Electric Company, and secretary San Francisco Section, A. I. E. E.
Chas. Gilman Hyde, professor of sanitary engineering, University of California.
Chas. Derleth, Jr., dean of the College of Civil Engineering, University of California.
George Fillmore Swain, professor of civil engineering, Harvard University and the Massachusetts Institute of Technology, and past president A. S. C. E.
Benjamin Ide Wheeler, president of the University of California.
Robert Sibley, editor Journal of Electricity, and in charge of meeting representing the five local sections of the national engineering societies.
Max Thelen, president of the California Railroad Commission.
Jerome Newman, consulting engineer and president of the San Francisco Section, A. S. C. E.
David M. Folsom, professor of mining, Stanford University, and Pacific Coast Fuel Oil Administrator.
Albert S. Schwabacher, Federal Fuel Administrator for California.
Elwood Mead, professor of rural institutions, University of California.
Lars Jorgensen, consulting engineer and president of the San Francisco Section, A. I. E. E.
Edmond O'Neil, acting dean of the College of Chemistry, University of California.
M. M. O'Shaughnessy, chief engineer for the city of San Francisco.

Prove we are idealists—

BUY A LIBERTY BOND

WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers
President—E. W. Rice, Jr., Engineering Society Bldg., New York City.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section
Chairman — Don. D. Morgan, 621 Pacific Electric Bldg.
Secretary—A. W. Nye, University of Southern California, Los Angeles, Cal.
Meetings—Second Tuesday of each month.

Nevada Section
Chairman—Geo. A. Campbell, Reno, Nev.
Next Meeting—April 13th.

Portland Section
Chairman—S. D. Searing, care Portland Railway, Light & Power Co., Electric Bldg., Portland, Ore.
Secretary—R. M. Boykin, care North Coast Power Co., 441 Pittock Block, Portland, Ore.
Meetings—Monthly.

Denver Section
Chairman — Norman Read, 828 Symes Bldg., Denver, Colo.
Secretary — Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p. m., followed by regular meeting.
March 16th — Lieut. Harry W. Lake—"French Warfare and Personal Experiences in the War."

San Francisco Section—
Chairman—Lars R. Jorgensen, Chronicle Bldg., San Francisco.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings — Fourth Friday each month—Engineers' Club, 7 p. m.

Seattle Section
Chairman — John Harisberger, 4015—4th Ave., N. E., Seattle, Wash.
Secretary — Glen Dunbar, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.
March 19th—L. S. Goodman and W. J. Jackson—"Effects of War Conditions on Cost and Quality of Electric Service."

Spokane Section
Chairman—Charles A. Lund, W. 828 Providence, Spokane, Wash.
Secretary—J. E. E. Royer, W. 408 Cleveland, Spokane, Wash.
Meetings—Third Friday of each month.
March 15th—J. J. Curran, V. H. Griesser, T. E. Halsey—"A Little Light on Lightning."

Utah Section
Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.

Vancouver Section
Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch
Chairman — A. J. Swank, University of California, Berkeley, Cal.
Secretary—G. F. Teale, University of California, Berkeley, Cal.

University of Colorado Branch
President—Robt. Newman, 1071—11th St., Boulder, Colo.
Secretary—William N. Gittings, 2429—12th St., Boulder, Colo.
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch
Chairman—V. Pearson, Moscow, Idaho.
Secretary — L. J. Corbett, University of Idaho, Moscow, Idaho.
Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch
Chairman—J. A. Hooper, Oregon Agr. College, Corvallis, Ore.
Secretary—L. Happold, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch
Chairman—H. W. Lewis, Stanford University, Cal.
Secretary—A. L. Morgan, Stanford University, Cal.

Montana State College Branch
Chairman—Roy C. Flagen, Montana State College, Bozeman, Mont.
Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Colorado State Agricultural College
Chairman—R. C. Richards.
Secretary—W. A. Stallings, Colorado State Agricultural College, Fort Collins, Colo.

Throop College of Technology Branch
Chairman—J. Paul Youtz, Throop Dormitory, Pasadena, Cal.
Secretary—Clark E. Baker, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch
Chairman — S. E. Stites, 301 Montgomery St., Pullman, Wash.
Secretary—E. W. Tollefson, Box 393, College Sta., Pullman, Wash.
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS

National Association of Electrical Contractors and Dealers
Chairman—W. Creighton Peet.
Secretary — Harry C. Brown, 41 Martin Bldg., Utica, N. Y.
Executive Committeeman-at-Large — W. D. Kohlwey, California; Executive Committeeman—S. C. Jaggar, Portland.

British Columbia Ass'n Electrical Contractors and Dealers
President—C. H. E. Williams, 509 Richards St., Vancouver, B. C.
Secretary—R. B. W. Pirie, 406 Yorkshire Bldg., Vancouver, B. C.
Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers
President—H. C. Reid, 507 Montgomery St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Monthly.

Electrical Contractors and Dealers Ass'n of San Francisco
President—J. M. Carlson, 175 Jessie St., San Francisco.
Secretary—J. W. Asher, 601 Howard St., San Francisco.
Meetings — Saturday, 12:15; Hof Brau Cafe.

Southern California Electrical Contractors and Dealers
President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
Meetings—Every Friday at 6:30 p. m. at the Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers
President—W. Cox, Santa Cruz.
Secretary—J. A. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and Dealers
President—F. V. McAvoy, 138 N. Center St., Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th.

Oregon Ass'n of Electrical Contractors and Dealers
President — A. S. Halls, 262 Stark St., Portland.
Secretary—J. Willis Oberender, 301-2 Dekum Bldg., Portland, Ore.
Meetings—Every Saturday, 1:30 p. m.—Secretary's office.

Portland Local Ass'n of Electrical Contractors and Dealers
President—J. H. Sroufe, Jaggar-Sroufe Co., Portland.
Treasurer — J. W. Oberender, 301 Dekum Bldg., Portland.
Meetings—Saturday, 3 p.m., at 301 Dekum Bldg.

Utah Society of Electrical Contractors and Dealers
President—J. V. Buckle, Buckle Electrical Co., 70 E. 1st St., Salt Lake City.
Secretary—E. H. Eardley, Eardley Bros. Co., 37 E. 1st St., Salt Lake City.
Meetings — Every Friday noon at Commercial Club.

Washington Ass'n of Electrical Contractors and Dealers
President — V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
Secretary — H. D. Alleson, 404 Oriental Bldg., Seattle, Wash.
Meetings — Quarterly—second Thursdays of March, June, September and December.

JOBBERS' ASSOCIATIONS

Electrical Supply Jobbers Association
General Secretary — Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.
Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers
President—Sam H. Taylor, 84—2nd St., San Francisco.
Secretary — Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Quarterly. Last meeting: Del Monte, January 24.

Electrical Credit Ass'n of the Pacific Coast
President—C. L. Gilson, Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.
Secretary — Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Annually: San Francisco; May.

OF ELECTRICAL INTEREST

National Electric Light Association
President—J. W. Lieb, N. Y. Edison Co., New York City.
Executive Secretary—T. C. Martin, 33 W. 39th St., New York City.
Meetings—June.

Pacific Coast Section, N. E. L. A.
President—H. F. Jackson, Holbrook Bldg., San Francisco.
Secretary—A. H. Halloran, Crossley Bldg., San Francisco.
Meetings—Annually, in April.
Next Meeting—Del Monte, May 9-11, 1918.

They get $30 a month and give their lives as well.

BUY A LIBERTY BOND

Portland Section, N. E. L. A.
Chairman—C. L. Wernicke, care Westinghouse Elec. & Mfg. Co., Portland, Ore.
Secretary — R. J. Davidson, care Pacific Power & Light Co., Portland, Ore.

Illuminating Engineering Society
Meetings—First Tuesday each month.
President—G. H. Stickney.
Secretary—Clarence L. Law.
Western representative—Romaine Myers, Bacon Bldg., Oakland.

New Mexico Electrical Association
President—M. R. Buchanan, Silver City, N. M.
Secretary—E. M. Haggerson, Silver City, N. M.
Meetings—Annually, in February.

Southwestern Electric and Gas Association
President—H. C. Morris.
Secretary — H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.
1918 Convention—April 15th and 16th, at Galveston, Texas. Headquarters, Galvez Hotel.

Northwest Electric Light and Power Ass'n
President—Guy W. Talbot, 1212 Spalding Bldg., Portland, Ore.
Secretary—Geo. L. Myers, 1212 Spalding Bldg., Portland, Ore.
Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.
Next convention will convene in Portland, September 11, 1918.

Los Angeles Jovian Electrical League
President—H. N. Sessions, San Fernando Bldg., Los Angeles.
Secretary—W. C. McWhinney, Southern California Edison Co.
Meetings — Every Wednesday, 12 m., at the American Cafe.

San Francisco Electrical Development League
President—R. E. Fisher
Secretary — J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Every Wednesday, 12:10 p. m.; luncheon, Palace Hotel.

Electric Metermen's Association
President — J. E. Bridges, Westinghouse Electric & Manufacturing Company.
Secretary — A. E. Coney, Great Western Power Company, San Francisco.
Meetings—About every 50 days.

Alameda County Electrical Club
President—George Drew, Pacific States Electric Company, Oakland, Cal.
Secretary — George B. Furmiss, Pacific Gas & Electric Company, Oakland, Cal.

Synchronous Club
Secretary—C. A. Blair, Los Angeles.
March 22d—S. J. Keese—"Light and Color Waves."

Telephone and Telegraph Society of the Pacific Coast—San Francisco Section
President—L. S. Hamm, Pacific Tel. & Tel. Co., San Francisco.
Secretary—Chas. H. Dobson, 835 Howard St., San Francisco.
March 21st — H. C. Blote — "Experiences with the Allied Armies in France."

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

National Officers
President—Charles T. Main, Engineering Society Bldg., New York City.
Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

San Francisco Section, A. S. M. E.
President—B. F. Raber, University of California, Berkeley.
Secretary—Chas. H. Delany, 445 Sutter St., San Francisco.
Meetings—Quarterly.
Thursday lunches have been arranged at the Engineers' Club, 57 Post St.

Los Angeles Section, A. S. M. E.
President—F. G. Pease, Mt. Wilson Solar Observatory, Pasadena, Cal.
Secretary—T. J. Royer, 200 Title Insurance Bldg., Los Angeles, Cal.
Meetings—Quarterly.

ENGINEERS' CLUBS

Oregon Society of Engineers
President — Orrin E. Stanley, Box 973, Portland, Ore.
Secretary—C. J. Hogue, Box 973, Portland, Ore.
Meetings—Annual: Feb. 4, 1918. Monthly: Third Thursday of each month.
March 21st—E. B. Thompson—"The Oregon City Locks."

The Engineers' Club of Seattle
President—J. F. Pinson, Seattle, Wash.
Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.
Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco.
President — B. P. Legare, 58 Sutter St., San Francisco.
Secretary—J. R. Brownell, 525 Market St., San Francisco.
Annual meeting: October.
March 22d — Jerome Landfield—"Russian Conditions."

Idaho Society of Engineers
President — W. H. Gibson, Mountain Home, Idaho.
Secretary—Ira F. Shaffner, Boise.
Annual meeting: January.

Engineers' Club of Oakland
President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

MISCELLANEOUS

American Ass'n for the Advancement of Science—Pacific Division
President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.
Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
Meetings—Annual.

American Chemical Society—Oregon Section
Secretary—Norman C. Thorne.

Foreign Trade Club
President — W. H. Hammer, Monadnock Bldg.
Secretary — Wm. E. Hague, Monadnock Bldg.
Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.
March 27th—Deva Ram Sokul—"Trade Opportunities in India."

Pacific Coast Gas Association
President — John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
Secretary—Henry Bostwick, 445 Sutter St., San Francisco.
Meetings—Annual. Next convention—September, 1918, in Los Angeles.

Society for Promotion of Engineering Education
Secretary—F. L. Bishop, University of Pittsburg, Pittsburg, Pa.

HAPPENINGS IN THE INDUSTRY

New Business

The Seattle office of the United States Rubber Company—Wire Division—524 First avenue South, Seattle, is supplying the Pacific States Electric Company with $15,000 worth of wire for use in 20 wooden ships under construction in the Sloan Shipyards at Olympia, Washington. Clarence P. Deming is Northwest manager of the Wire Division, United States Rubber Company.

The contract for furnishing transformers to the city light department of Seattle, Wash., has been awarded to W. R. Hendry & Co., for $55,778.94.

The Western States Gas & Electric Company has secured five-year renewal contract covering the electrical requirements of the Pacific Sanitary Manufacturing Company of Richmond, Cal.

NePage, McKenny Company, electrical engineers and contractors, Armour Building, Seattle, are engaged in constructing a transmission line from Bremerton to Keyport, Washington, for the Bureau of Yards and Docks, same to cost about $9000. They are also doing the complete electrical work in the Bradner Apartments, aside from a large amount of work for the Emergency Fleet Corporation.

The firm of Cutting & Washington, Cambridge, Mass., representatives of radio and wireless apparatus, have installed at the offices of A. H. Cox & Company, 307 First avenue South, Seattle, a demonstration plant, and in some recent tests made by inspectors of the government, this proved highly proficient. There is no buzzing in the receivers and dangerous high voltage current is eliminated on the secondary side and it is possible to handle any part of the apparatus while it is in operation.

The A. G. Manufacturing Company, 1350 Dearborn street, makers of switchboards, stage lighting, and other equipment, has just completed manufacture of the equipment for the Marlowe Theatre at Helena, Mont., including switchboards, panel boards, border lights, footlights, stage plugs, receptacles and dimmers. The company is also doing much marine work including outlet boxes and telltale or running light indicators. The main lines, however, are switchboards, knife switches, steel boxes and specialties, having the only knife switch plant on the Pacific Coast.

A. H. Cox & Company, 307 First avenue South, Seattle, has finished installation of six cranes for the Queen City Machine Works, which have a closed circuit automatic switch attachment and other features, making them different from

You have already invested your happiness in the U. S.—Support your investment.

BUY A LIBERTY BOND

any other kind. Manager Edwards of the Queen City Machine Works prepared the design for these cranes. The company has also completed installation of the electrical equipment on a ten-ton marine elevator at the Oregon-Washington Dock which will be operated by a variable speed 25 horsepower Allis-Chalmers motor.

New Power Loads

An additional section of switchboard has recently been added to the private branch exchange in the Hotel Tacoma at Tacoma, providing a two-section switchboard. The hotel company has just equipped a building located across the street from the main hotel to be used as an annex, and ninety-five telephone stations have been installed in the new rooms.

As a result of the intense activity in shipbuilding industry at Eureka, Cal., the Western States Gas & Electric Company has accepted a large amount of additional power business recently. The Hammond Company has abandoned operation of its private power plant, which operates a sawmill during the day, and will purchase current from the Eureka division. The Rolph Company is doubling its electric power requirements and the new shipyard to be established in the city will require 400 horsepower.

The National Ice and Cold Storage Company is installing 180 horsepower in motors which will be served by the Western States Gas & Electric Company, Stockton division. This installation displaces a steam power plant formerly operated by the ice company, making a total electric load of 230 horsepower, energy for which is furnished by the Stockton company.

The Columbia Steel Company, Pittsburg, Cal., is building an addition to its main foundry and a building in which will be placed two 30-ton and one 10-ton traveling cranes. A new 15-ton locomotive crane will also be added—all served by the Pacific Gas and Electric Company. The output of the plant will be increased 60 to 70 per cent.

Changes and Beginnings

The Hallidie Company of Spokane, of which the U. S. Iron Works, Seattle, is a subsidiary concern, has purchased the Sammis Monumental Works in Spokane and is moving its plant to that point from Railroad avenue and Wall street. About $75,000 worth of new machinery is being installed. Among other work being turned out by the company are four 2500 horsepower steam turbines for Coughlin & Sons Shipyards at Vancouver, B. C., and ten similar turbines for the United States government.

The Jaggar-Sroufe Company of Portland, Ore., have opened up their new office at 103 West Park street.

On March 4, 1918, the offices of the New York Distributing House of the Western Electric Company, Inc., moved to 151 Fifth avenue, New York City. Their previous location was at 463 West street, New York City. The building at this address will be devoted to the activities of the engineering department.

In connection with the transfer of the general office of the Hotpoint Division of the Edison Electric Appliance Company from Ontario to Chicago, the company has also transferred its contract department. On and after April 1st, therefore, all communications in connection with contract work for the Hotpoint Division should be addressed to the general office of the Hotpoint Division, 5660 West Taylor street, Chicago.

The Westinghouse Electric and Manufacturing Company has leased for a period of years the Baxter Stove Company, Mansfield, Ohio, with the intention of consolidating at this plant the manufacture of its heating appliances now being carried on at some of the other Westinghouse plants.

The McFarland Telephone Company has recently been incorporated in Kern county, Cal.

The Round Lake Irrigation Company was incorporated March 3d, in Seattle, Wash.

Florence, Ore., has a new telephone company, which was incorporated March 2d, under the name of the North Fork Co-op. Telephone Company.

J. D. Barnhill, Inc., announce a change in name to Dodd-DuBosque Company, Inc., with offices as before, at 110 West Thirty-fourth street, New York.

Issue of Power Bonds

The Railroad Commission recently issued an order authorizing the San Joaquin Light & Power Corporation to issue $767,000 6 per cent first and refunding bonds, payable in 1950, to be sold at not less than 90 per cent of face value, and the proceeds to be deposited in a special fund to be expended hereafter on the orders of the commission. The money is needed, the company says, to buy property, construct, expand and improve its facilities and service, and is to be spent from time to time as the liabilities are incurred. The company, instead of issuing bonds to provide funds for paying for 85 per cent of the cost of additions and betterments, has adopted a policy of providing for but 75 per cent of these expenditures by bonds. In general, its 1918 electric construction program calls for the installation of a hydro-electric plant at its Crane Valley dam, a plant also at its No. 1 reservoir, and the building of a six-inch natural gas transmission line to connect its Bakersfield steam generating plant with the Midway Gas Company's natural gas line from Midway Oil fields to Los Angeles. Also, preliminary work on its new proposed hydro-electric plants on the San Joaquin River and the North Fork of the Kings River, the completion of transmission lines, substations, and the construction of distribution lines to take care of new business.

Good Showing for Power Company

Pacific Power & Light Company, Portland, made a good showing of net earnings for January, also for the year 1917. The net for January was 33 per cent and the gross revenues increased 17 per cent over the same month of last year. For the twelve months the net earnings were greater by 22 per cent, operating expenses by 3 per cent, and the gross earnings 13 per cent higher than the corresponding period of 1916. The following figures show the exact status of the company affairs:

	Jan., 1918	12 Months
Gross revenue	$153,062	$1,166,775
Operating expense	71,783	785,864
Net earnings	$ 81,279	$ 883,909
Balance after deducting all fixed charges	$ 45.081	$ 447,045

Calaveras Dam Goes Out

Work on San Francisco's new water supply in Calaveras Valley was delayed a year, half a million dollars damage was done, and the surrounding country escaped devastation by a seeming miracle, between 6 and 7 o'clock on Sunday morning, March 24, 1918, when the Calaveras dam, a $2,500,000 construction work seven miles back of Milpitas, went out. The slide was caused by the weight of the clay which is being used to ballast the center of the dam.

A rumble which startled the 200 workmen quartered at the dam was the only warning of the impending disaster. Men rushed from the bunkhouses in time to see 600,000 cubic yards of earth slide into the reservoir and smash against the 210-foot concrete tower which housed the flood gate machinery, tearing the tower from its base and plunging it into the water. The fall of the earth blocked the water tunnel under the dam and prevented the 60 feet of water in the reservoir rushing down onto the country about Sunol.

The dam has been under construction for two years, and would have been finished next year. It will be the largest dirt dam in the world, and was 80 feet thick a quarter of a mile across the canyon, and nearly 100 feet in height. The building of this great structure was described, illustrated in full, in the Journal of Electricity, February 15, 1917.

Your best insurance for the future.

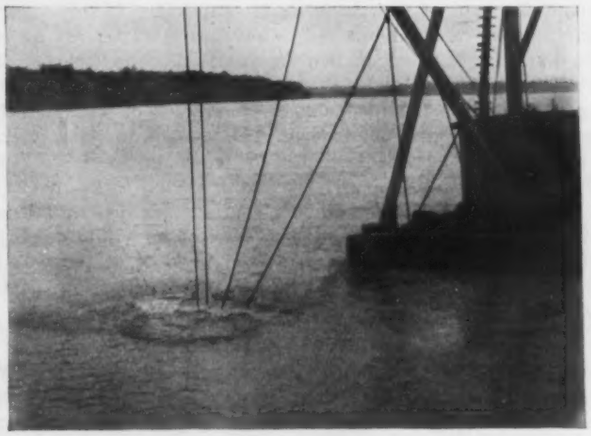
BUY A LIBERTY BOND

LATEST IN EVERYTHING ELECTRICAL

(The recent featuring of accidents occasioned by poor installations in laundry rooms and other damp places lends interest to the pull chain socket here presented which is specially designed to insure complete insulation. A special safety switch which can be handled with impunity by persons not skilled in electricity, a series of porcelain receptacles, and a new use for lifting magnets, are further included among the new devices.—The Editor.)

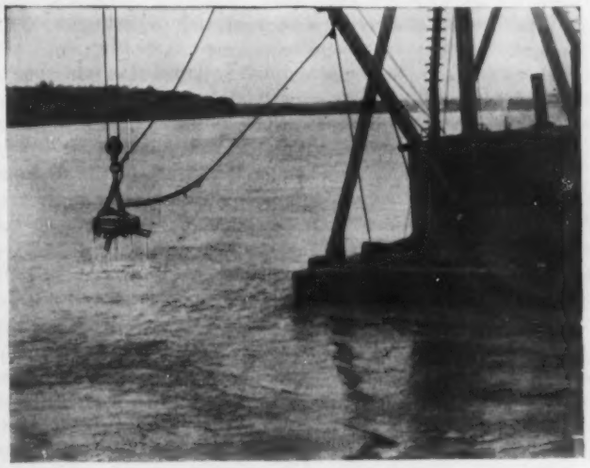
Recovering Sunken Treasure

The Arrow Transportation Company, operating a line of barges on several of the southern rivers, lost one of its barges in the Tennessee River near Paducah, last March. This barge, loaded with about 420 tons of sand-cast pig-iron, collided with the pier in the river and the barge began listing, dropping its load gradually, and, therefore, strewing the pig-iron along the bed of the river for a distance of 100 feet or more.



Lifting magnet disappearing below the surface in seeking its load of pig-iron which has been lost through sinking of a 400 ton cargo.

The loss represented about $10,000, and the insurance company paid over this maount to the transportation company. The insurance company later made arrangements to recover what they could of the cargo by means of a barge and a C-H lifting magnet, purchased from the Cutler-Hammer Mfg. Co., of Milwaukee, Wis. By letting the magnet down to the



Magnet clear of the water after having picked up a load of pig-iron from the bottom of the river

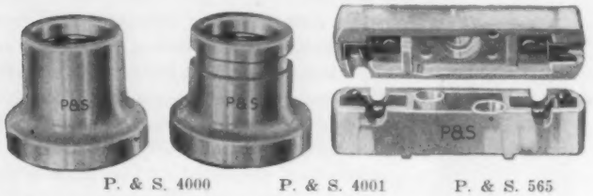
bed and dragging it along in the vicinity in which the material had sunk, over 90 per cent, or approximately 400 of the 420 tons were recovered.

The cargo was not only saved, but, because of the rising cost of pig-iron it was sold for $16,000, while the total cost of recovering, including the rental of barges and the purchase of a magnet, amounted only to $4000, which gave the insurance company approximately $2000 plus a lifting magnet, which has since been put to use in salvaging other lost cargoes. The magnet used was 43 inches in diameter, and of the standard C-H type, which is waterproof.

Porcelain Concealed Receptacles

P. & S. 4000 and 4001 are new P. & S. porcelain concealed receptacles. The wires are introduced from the back of these receptacles. The outer porcelain shell entirely conceals the supporting screws as well as the binding screws and terminals. P. & S. 4000 is shown without the shade-holder groove, and P. & S. 4001 with the shade-holder groove. The outside diameter of the base of these receptacles is 2 5/16 inches.

P. & S. 565, a cleat rosette of special, rugged construction, is designed to carry the wires a full half-inch from the



P. & S. 4000 P. & S. 4001 P. & S. 565

P. & S. Specialties

surface wired over. The terminals are arranged to separate the wires by a space of 2½ inches, and the binding screws which secure the cap to the base are so arranged that the cap may be pivoted on one end while the other end of the cap, when the binding screws are released, swings in or out of position and is thereby made easy to wire on a step-ladder or at the bench.

Ample wiring room will be found in the base and provision is made in the cap for a practical knot in the drop-cord to relieve the strain on the terminals.

Small Motor Switches

Below are shown illustrations of two switch condulets of the ZY series—the latest additions to the large family of conduit fittings manufactured by the Crouse-Hinds Company of Syracuse, N. Y. As safety-first fittings, it is claimed for them that they protect the switch operator and the person renewing fuses from shock; they cannot be operated by accident; they withstand the roughest usage; water will not drain into tnem, and it is impossible for lint or other inflammable particles to lodge upon the current-carrying parts, and thus create a fire hazard.

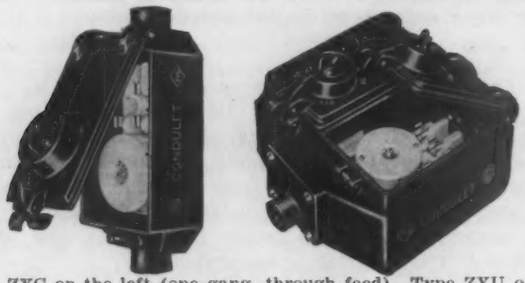
Both the body of the condulet and its cover are cast iron. Inside is a combined 20-ampere snap switch and fuse block. The switch is externally operated, and its handle interlocks

The average American has a better opportunity in life than the average German. Why?

BUY A LIBERTY BOND

with the latch of the door in such a way that the latter cannot be opened when the switch is in the "on" position. As a result of this arrangement, the circuit is dead when the door is open, and fuses can be replaced without danger of shock or short circuit.

As the machine operator or any other person not skilled in electricity can change fuses with perfect safety in ZY condulets, their use prevents all the loss in productive time which



Type ZYC on the left (one-gang, through feed). Type ZYU on the right (two-gang, through feed, one-main, two branch hubs)

is unavoidable where an electrician must be sent for to replace fuses.

The manufacturers list ZY condulets in one and two-gang forms and in sizes and arrangements of threaded conduit hubs to meet various conduit wiring arrangements.

The New Benco Pull Chain Socket

The Benco Pull Chain Socket has been in process of building for several years. This socket has been on the market for a while, but, nevertheless, has remained in its experimental stage until the present time.

The pull member differentiates from the other, in that it is vertical and direct in action. The chain passes down inside the socket, completely insulated from live parts of the device which are molded in an insulating composition. Recently, this socket was subjected to the severe test given to devices of this kind by the Underwriters' Laboratories, and approved for use in damp places on account of the high insulation and the good protection from moisture.

The shell in the weatherproof form of this socket is made in either aluminum or copper; the asbestos composition base of the molded parts is non-absorbative, so that there is no possibility of the molded portions becoming conductors from the live parts to the pull member. The composition of the molded parts will stand a considerably higher temperature than the socket will reasonably ever have.

These sockets are provided with a special lamp grip feature which prevents lamps from falling. The device is approved for a rating of 660 watts, 250 volts, and the operating mechanism is of a quick make and break type.

The threaded portion at the base of the shell is designed to receive all of the Banjamin type "S" fixture connectors and reflectors.

Electrical Heating Publication

An article, "Electrically Heated Japanning Ovens," by C. F. Hirschfield, reprinted from the N. E. L. A. Bulletin, and "Heat Calculation for Baking and Drying Ovens," by W. S. Scott, reprinted from the Electrical Journal, have just been issued in bulletin form by the Westinghouse Electric & Manufacturing Company. This publication should be of much value to central station solicitors who are endeavoring to interest their customers in the electrical heating of ovens, as well as to present and prospective users of such equipment.

As a citizen you are responsible—
pay the bill.

BUY A LIBERTY BOND

GOVERNMENT OPPORTUNITIES

New Opportunities in the Ordnance Service

So pressing has become the need for persons to serve in the Ordnance Department as mechanical draftsmen and mechanical engineers, that the Acting Chief of Ordnance has suggested that the American Society of Mechanical Engineers assist in meeting this demand.

As indicated by the civil service announcements, there is a very urgent need for other employees. Particular stress is being placed at the present time on the positions of mechanical draftsman and inspector of munitions.

Mechanical draftsmen should meet the requirements outlined in announcement No. 242. Almost any man with mechanical drafting experience can be utilized in some position in the Ordnance Department. There are no openings, however, for architectural and structural draftsmen.

Mechanical engineers with certain qualifications are employed in the Ordnance Department as inspectors. The demand for men of this training is practically unlimited, and any number can be employed to advantage. They are an important part of the ordnance organization. They inspect the munitions that are to be sent to our soldiers in France, and upon this inspection depends the character of war material which is supplied to our troops. The demand for men in this branch of the service is increasing each day, and will continue to grow.

The names of any engineers who are qualified to fill any of the positions mentioned, and who would be willing to serve in the Ordnance Department, should be sent at once to L. H. Van Dusen, Major, Ordnance, N. A., Washington, D. C., and detailed information will be sent by return mail.

Draftsmen Wanted

There is wanted in the office of the Department Engineer, Santa Fe Building, San Francisco, a number of topographic draftsmen for work in connection with military mapping. An opportunity is presented those who desire to do their bit and who are qualified for this work. Salaries range from $90 to $125 per month, depending upon ability. Those who prove proficient can have employment as long as available funds permit.

Women in Ordnance Department

According to a call just received by the Military Bureau of the University of California, there is an urgent need for women to serve in the Industrial Service section of the Ordnance Department. Accepted candidates will be assigned as supervisors to district offices of the department. Candidates should possess special experience in dealing with labor problems in manufacturing establishments. Certain types of industrial investigation or experience in employment management departments are illustrative of the work which is considered most useful in meeting the requirements.

As acting supervisors in district offices of the Ordnance Department, these women will be responsible for keeping the department informed of conditions of labor in plants in their district with a view to making constructive suggestions from problems arising in war industries.

War Training Course for Electricians

A war training course for electricians and telephone men needed for the United States Army has just been published by the Federal Board for Vocational Education. This course, it is planned, will be given to drafted men, enlisted and detailed on subsistence and pay to schools co-operating with the Federal Government in the preparation of mechanics and technicians for military service. The course consists of 36 lectures and four classroom, field and shop units on electric wiring, testing, motors and generators, and telephone work. The instruction book is known as Bulletin No. 9, and may he had free on application to the Federal Board of Vocational Education, Ouray Building, Washington, D. C.

NEW ELECTRICAL DEVELOPMENTS

(Interest in the Northwest centers in the development of the plans of Seattle and Portland for municipal projects. The Pacific Power & Light Company is installing further improvements, and in Oregon the largest milling and smelting plant of this region has been contracted for, which will act as a load builder in the near future. The skip-stop system for electric railways is being adopted as an electricity economy measure in the bay region. In the Southwest, the municipal rivalry in Los Angeles is again to the fore, and there are numerous applications for water for power developments in this and the Inter-Mountain Districts.—The Editor.)

THE PACIFIC NORTHWEST

KASLO, B. C.—The question of establishing a 24-hour service in connection with the municipal electric-light plant is under consideration. Fred D. Emory is chief engineer.

KELSO, WASH.—The district office of the North Coast Power Company, formerly at Kalama, will be transferred to Kelso. F. A. Peterson will assume the management of the Kalama office.

VANCOUVER, WASH.—The Portland Railway, Light & Power Company contemplates an extension of its 11,000-volt commercial feeder line to pick up 2000 horsepower steel shipbuilding load. F. H. Gray is division manager.

SEATTLE, WASH. — The lighting department of the City of Seattle has secured a contract to supply 2500 horsepower to the shipyards of the Erickson Engineering Company. This company will construct steel ships.

SEATTLE, WASH.—C. H. E. Williams, electrical engineer with offices in Seattle and Vancouver, B. C., has secured the contract for wiring the ten 9400-ton steel ships now under construction by the Erickson Shipbuilding Company at this place.

WALLA WALLA, WASH. — Further improvements are contemplated by the Pacific Power & Light Company to its local system. The company is building a new switching station at Pasco, which, when completed will improve the service in Walla Walla.

SEATTLE, WASH.—Pacific States Electric Company, 570 First avenue South, Seattle, has secured the contract for supplying all the electrical supplies for use in the 20 3500-ton Ferris type wooden boats which the Sloan Shipyards Corporation is building at Olympia, Wash.

PORTLAND, ORE.—Bids will be received by the Commission of Public Docks up to April 9, 1918, for building an $800,000 or $900,000 elevator, including transformer house, etc. Certified check for 5 per cent of bid, on bank with capital of at least $100,000, is required with bid.

SNOHOMISH, WASH.—Mayor J. W. Hall has publicly announced that he is in favor of a movement to utilize water power of the county for municipal electric-light plants, asserting that Snohomish can obtain 5000 horsepower from the dam of the city gravity pipe line. The Commercial Club is also back of the project.

PORTLAND, ORE.—An ordinance was introduced recently in the city council, which, if passed, will put up to the vote of the people at the city election on April 16th, the question of voting $4,000,000 in bonds for the purchase of a new power site and the erection thereon of a new power plant for additional electrical power.

PORTLAND, ORE.—What may become the first unit of a municipal power plant is now under construction by the water bureau at the headworks of the Bull Run water system. Plans have been prepared for the installation of a 4-kw. electric plant for lighting the buildings at the headworks. L. M. Kaiser, superintendent of the water bureau, has charge of the work.

PORTLAND, ORE.—The Pacific Power & Light Company, Portland, is raising the sum of $500,000 for capital requirements to meet demands for more power in the territory.

GARDINER, ORE.—Steps have been taken by Warren Reed of Gardiner and James R. Wheeler and Arthur Blanchard of Marshfield to organize a new electric company to be known as the Umpqua Power Company. The new company will take over the property of the Gardiner Light & Power Company and will furnish electrical service in this city and Reedsport, now without service.

TACOMA, WASH.—Council has decided to place on ballot at the coming election a proposition to acquire the street car system of the Tacoma Railway & Power Company for a sum not to exceed $5,200,000. The aggregate is composed of $4,500,000 for purchase of system, $300,000 for refunding the present tide flats line, and $400,000 to make repairs on streets and the rehabilitation of the plant of the company.

SEATTLE, WASH. — The Board of Public Works has been authorized by ordinance to prepare plans and specifications for the immediate construction of the new elevated municipal railway on Whatcom and Spokane avenue, for which $350,000 in bonds was voted on March 5th. Pending the sale of the bonds, $50,000 is to be borrowed from the general fund to aid in this construction, ordinance for such loan having been passed and approved by the mayor.

GRANTS PASS, ORE.—A contract has been awarded for the installation of a large ore-reduction plant for the Alameda Mines Company on Rogue River, 27 miles below Grants Pass. This is to be the largest milling and smelting plant in Oregon and one of the largest on the coast, with a daily capacity of 400 tons. The contract calls for the installation and equipment of an ore-concentrating mill of not less than 200 tons daily capacity, including power machinery for operation of the entire plant. The contract price to be paid for the plant is $200,000.

SEATTLE, WASH.—Following bids were received for power plant to be supplied to the city, Grant, Smith & Company, a local concern, bidding on three propositions:

Proposition A—Plant on the Skagit River, all permanent construction, with ultimate capacity of 420,000 kilowatts; $4,297,000.

Proposition B—Plant on Skagit River, largely timber construction, $2,381,000.

Proposition C—Plant on Skykomish River near Gold Bar, permanent construction; $3,556,000.

The Puget Sound Bridge and Dredging Company, Central Building, submitted bid for construction of a plant on the Stillaguamish River with a capacity of 36,000 kilowatts, delivered, all permanent construction, at $4,200,000.

Packwood Lake Construction Company submitted two bids for a complete power plant on Packwood Lake, $4,031,000 for high tension switching outside, and $4,121,000 for a complete power plant with switching inside. These bids did not include transmission lines. According to the estimate of City Engineer Arthur J. Dimock, a steel tower double line transmission from the Skagit River to Seattle would cost about $1,200,000, and from the Skykomish site about $500,000.

If you hadn't lived here you might not have made that money.

BUY A LIBERTY BOND

PACIFIC CENTRAL DISTRICT

OAKLAND, CAL.—All wires in the Lake District between Wesley avenue and Cottage street, are being placed underground.

FRESNO, CAL.—The Copper Mine substation of the San Joaquin Light & Power Company was recently destroyed by fire, causing a loss of about $3000.

SAN FRANCISCO, CAL.—Extension of the Municipal Railway beyond the Twin Peaks tunnel was decided upon at a conference in the mayor's office.

NAPA, CAL. — The Pacific Gas & Electric Company having asked for a franchise for power purposes in this city, a resolution of intention calling for bids was adopted by the council.

SAN FRANCISCO, CAL.—Sealed bids will be received at the office of the board of public works, April 10th, for furnishing railway signal material for the Twin Peaks tunnel line, Municipal Railway System.

PACIFIC GROVE, CAL.—There is now a bright prospect of the immediate improvement of the tracks and equipment of the Monterey and Pacific Grove Railway, and an ultimate surety of new rail and rolling stock.

REDDING, CAL.—The city trustees have passed an ordinance authorizing the submission to the electors of a bond issue of $40,000. This has to do with the extension of city lights into the homes and business places of the town.

SAN FRANCISCO, CAL.—Directors of the Northwestern Electric Company have declared regular quarterly dividend No. 12 of $1.50 per share on the preferred stock, payable April 1 to stock of record at the close of business March 3.

ALTURAS, CAL.—The special election held in the north end of Surprise Valley to determine whether an irrigation district should be formed for the purpose of tapping Cow Head Lake in that valley and irrigating about 17,000 acres of land, was overwhelmingly carried.

AUBURN, CAL.—The new electric power plants—Halsey at Clipper Gap and Wise at Auburn—are closed and there is a washout in the Hotchkiss orchard at Applegate, as the result of a tunnel cave-in on the new canal of the Pacific Gas & Electric Company on the Hotchkiss property.

OAKLAND, CAL.—The American Dredging Company is about to start an eight months job along the Alameda estuary. Electric power will be utilized to operate the "American" dredger. A pole line will be extended along the water front supplying the electric power, to which will be extended a submarine cable.

FRESNO, CAL.—San Joaquin Light & Power Corporation has filed with the Railroad Commission an application for authority to issue $1,000,000 of its 6 per cent first and refunding mortgage bonds. The proceeds from the bond sale are to be used to complete additional facilities upon which work has already started.

SAN FRANCISCO, CAL.—The skip-stop plan of operating street cars in the East Bay cities will be inaugurated on April 1 by the San Francisco-Oakland Terminal Railways. The scheme of having fewer stops for street cars is advocated as a means of saving fuel and for shortening the trip between Oakland, Alameda and Berkeley.

KNIGHTS FERRY, CAL.—Plans are being considered to reopen the old power plant at Knights Ferry, which was closed down over 12 years ago. The Railroad Commission has asked that this plant be used, as it will be a means of conserving oil. The plant is owned by the Sierra and San Francisco Power Company. H. F. Jackson, 58 Sutter street, San Francisco, is general manager.

Better than charity is support.

BUY A LIBERTY BOND

WILLOWS, CAL. — A proposition is on foot to lease pumps and motors for this year and install them at Sidds Landing and have them furnish water for the River canal and also for irrigating a large tract of rice land. It is understood that these pumps and motors are now being negotiated for by Chas. L. Donohoe, who is interested in much of the land that has been denied water by the Railroad Commission.

SAN FRANCISCO, CAL.—Plans for a union railroad depot for San Francisco on Mission street, between Eleventh and Twelfth, were outlined in an address by M. J. Lyon to the city planning committee of the Commonwealth Club. The plan includes the extension of Van Ness avenue to Mission street and an elevated electric road from the second story of the ferry building along Minna street to the second floor of the proposed union station, and then along McCoppin street with a surface line to connect with the Twin Peaks tunnel line.

THE PACIFIC SOUTHWEST

LOS ANGELES, CAL.—Contracts for additional lights in the Graham Lighting District have been awarded by the supervisors to Southern California Electric Company.

LOS ANGELES, CAL.—Sealed bids will be received by the board of supervisors up to April 18th, for moving and erecting power house equipment in the new power house at the county hospital.

PASADENA, CAL.—The city purchasing agent has been authorized to purchase without contract, lamps, solid tires, electrical supplies and wire for the light department.

BOWIE, ARIZ.—The Southern Pacific Company has appropriated $20,000 for remodeling its depot in Bowie, and is also contemplating the installation of a power plant here.

DEMING, N. M.—A project that is being agitated here is the establishment of a power plant at Elephant Butte dam to furnish power for the pumping plants in Mimbres Valley.

LA HABRA, CAL.—Plan fathered by La Habra Mining & Milling Company to secure lights for the town is approaching completion and is meeting with approval of citizens and merchants.

WHITTIER, CAL.—City clerk has been instructed to advertise for bids on electric motors for use in the city's pumping plant under specifications provided by the water superintendent.

DEMING, N. M.—Extensions and improvements involving an expenditure of at least $300,000 will be made at Camp Cody, Deming. The proposed work will include another electric power plant of 185 horsepower.

SANTA FE, N. M.—The voters of Des Moines, N. M., will pass on the question of whether or not that town issues $50,000 worth of bonds for the purpose of purchasing and improving the present water and light plant.

EL CENTRO, CAL.—Construction of a new power line from Hanlon heading to a point on the Alamo where dredges are being operated has been ordered by directors of Imperial Irrigation District. The power line is to cost $11,000.

RIVERSIDE, CAL.—The Southern Sierras Power Company has announced that approximately $279,000 will be expended in the reconstruction of one of its main transmission lines, extending for a distance of 60 miles from its hydroelectric plant located on Rush Creek in the Sierra Nevada range.

ORANGE, CAL.—The first step toward installing a street lighting system in this city was taken by the city council when instructions were given to the city attorney to draw up a resolution of intention for that improvement. Specifications under consideration by the council provide for a handsome system of concrete posts of the single light type.

BISHOP, CAL.—A mill will be built at the camp at the Pine Creek tungsten claims, recently secured by the Cooper Shapely of the Round Valley Tungsten Company. Two Marcy mills with a combined capacity of 150 tons daily will be installed. Arrangements, it is understood, have been made with

the Southern Sierras Power Company for furnishing electricity to operate the proposed mills. To furnish the service a transmission line 12 miles long will be erected.

SAN DIEGO, CAL.—The common council is offering for sale to the highest bidder, a franchise to construct, maintain and operate a street railway. Sealed bids will be received up to April 15th.

RIVERSIDE, CAL.—The Southern Sierras Power Company has petitioned the State Railroad Commission for permission to purchase and incorporate under its management the Corona (Cal.) Gas & Electric Company, the Rialto (Cal.) Light & Power Company, and the Bishop (Cal.) Light & Power Company.

LOS ANGELES, CAL.—An additional hydro-electric unit capable of developing 20,000 horsepower, which is now going to waste, will be built in the near future by the Los Angeles municipal government, at a cost of $1,400,000, and placed in active competition with the private gas and electric companies, according to the mayor of Los Angeles.

YUMA, ARIZ.—The Imperial Oil Mills has filed an application for a franchise to construct and operate electric light and power lines along, over and across all public highways in Yuma Valley, Ariz. It is the intention of the board of supervisors, at a meeting on April 22, 1918, to grant the application. Construction of the system will be commenced within 60 days and it will be in operation within one year from and after the granting of the proposed franchise.

RIVERSIDE COUNTY—Geo. L. Lamy of Los Angeles has made application to the State Water Commission for 50 cubic feet per second of Lake Elsinore, tributary to the San Jacinto River in Riverside county, for power purposes. The proposed works contemplate an open cut and cement pipe with a concrete headgate in the lake, and canal and a pipe line 35 miles in length. By a drop of 8 feet it is proposed to develop 3300 theoretical horsepower. Cost of project is placed at $300,000.

LOS ANGELES, CAL.—Twenty private power lines crossing tide lands under the control of the Harbor Commission will be cut down to prevent competition with municipal power, unless the private corporations retire from the field, according to the decision of the Harbor Commission. This commission, having determined that industries at the harbor will be supplied with municipal power, have decided to refuse permits for electric lines crossing tide lands under its control.

THE INTER-MOUNTAIN DISTRICT

WHEATLAND, WYO.—Bonds have recently been voted for the installation of a municipal electric-light plant in Wheatland.

COLORADO SPRINGS, COLO.—Colorado Springs Light, Heat & Power Company seeks a 10 per cent increase in its rates in residential lighting.

SALT LAKE, UTAH—At a meeting of the directors of the Pope-Shonon mine, it was voted to install electric power and machinery at the earliest possible date.

BONNERS FERRY, IDAHO—John E. Price & Company of Seattle, Wash., have taken an option on the holdings of the Bonner Water & Light Company of Bonners Ferry, the price being placed at $135,000.

BRIGHAM, UTAH—The electric light committee is contemplating removing the lamp poles from the center of the street to the curb line in the business section of the city. C. O. Roskelly is manager of the municipal electric-light plant.

BEAVER CITY, UTAH—The State Industrial Commission of Utah has ordered the purchase of $2000 of Beaver City electric light bonds, bearing 5½ per cent interest, due in 1937. The purchase is still subject to the action of the state board of examiners.

GREAT FALLS, MONT.—Work will be started immediately by the Anaconda Copper Mining Company on the construction of a plant at the Boston & Montana works at Great Falls for the electrolytic production of ferro-manganese. Five furnaces will be installed, each with a daily capacity of 250 tons. Electric power will be supplied by the Montana Power Company.

NAMPA, IDAHO—At a recent meeting of the city council, the mayor was authorized to enter into a contract with the Idaho Power Company for the placing of 100 incandescent street lights to take the place of 61 arc lights that now represent all the city lights.

SALT LAKE CITY, UTAH—Hinckley-Deseret, Hinckley-Oasis and Abraham are to have electric lights. The Deseret Irrigation Company closed a contract with an eastern concern for the installation of a 100 horsepower lighting plant with 15 miles of transmission lines.

CASPAR, WYO.—The Natrano County Electric Company and the Wyoming Electric Company, both of Caspar, have been consolidated under the name of the Natrona Power Company. The concern is capitalized at $1,000,000 and furnishes electricity to the Casper district.

SALT LAKE, UTAH—Intending to build a hydro-electric plant to develop 350 horsepower, Charles B. Bartlett of Vernal has filed application with the state engineer for use of 40 second cubic feet of water from Whiterocks Creek, Uintah county. He intends to market the resultant power in Lapoint and that vicinity.

TOOELE, UTAH—The Utah Lime & Stone Company is negotiating with the Clark Electric Power Company of Tooele to extend its electric transmission lines to Flux and Dolomite to furnish electricity to operate its factories at those places. The lines of the Clark company now extend within seven miles of the property of the Utah Lime & Stone Company.

YERINGTON, NEV.—Application has been made to the State Water Commission by A. M. Wishart, Alexander Cameron and James Herrin of Yerington to impound 20 second feet of the waters of Sweetwater Creek in Mono county. They propose to build a dam 10 feet high and 48 feet long, and running from the pool so formed is to be a metallic flume three and one-half miles long. It is estimated that 2575 horsepower will be developed.

BOISE, IDAHO — The question of signing a five-year lighting contract for the city street lights in the residence section was discussed at a meeting of the city council. The old contract has expired, and by adopting a newer light system the city can save $3000 a year. The public utilities will not permit of less than a five-year contract. The contract is to call for the installation of 100 new lights.

COTTONWOOD, IDAHO—At a mass meeting held in Keuterville last week, a new telephone company was organized in order to provide adequate telephone facilities to serve that community. It is estimated that the new line will cost about $4000, of which $3200 is already subscribed. A permanent organization was effected at the meeting, and trustees were elected with instructions to proceed at once with the construction of the line.

SALT LAKE, UTAH—G. R. Coroy of Salt Lake has filed an application with the state engineer for permission to use 125 second feet of water from the Price River to develop 1600 electrical horsepower. The proposed plant would be within a few miles of Helpe and would involve the construction of a concrete dam three feet high and forty feet long, the water to be conducted in a ditch for a distance of a mile and a half, and through two four-foot wheels.

Think—if we should fail?

BUY A LIBERTY BOND

Ad-itorial Comment

(Service to the electrical dealer is the keynote of the advertising in this issue. The man who sells electrical devices will find valuable information herein. Thus he is prepared to meet the demand which is being created by means of popular advertising. But as the copy and medium which creates the demand are seldom adapted to help the dealer anticipate it, the wise advertiser complements his popular advertising by well-timed announcements in the trade and technical press.—The Aditor.)

Crocker-Wheeler Co. tells of the dependability of C-W motors for all services.

Faries Manufacturing Co. advertises patented parts for making up lighting fixtures.

Hurley Machine Co. reiterates the importance of Thor washers as labor savers in war times.

Sprague Electric Works suggests the use of BX cable and accessories as a means for minimizing fire hazard.

Wagner Electric Manufacturing Co. advertises that it can supply a motor to care for any service on A. C. lines.

Moloney Electric Co. exemplifies its product by showing a Western installation of 60,000 volt transformers.

Pacific States Electric Co. gives prominence to the manufacturers for whom it acts as distributors on the Pacific Coast.

Weston Electrical Instrument Co. invites investigation of the superiority of its indicating instruments for electrical measurement.

Hubbard & Company's transmission line specialties and pole-line hardware "trouble-proof" the line by eliminating the weak points.

Condit Electrical Manufacturing Co. has issued seven bulletins illustrating and describing the use of electrical protective devices.

Allis-Chalmers Manufacturing Co. shows the two 23,000 horsepower Big Creek units as the most powerful impulse wheels in the world.

Hotpoint Division, Edison Electric Appliance Co., details its advertising in popular magazines as an incentive for retailers to profit by tieing in therewith.

The Electric Storage Battery Co. has been making storage batteries for thirty years, and their batteries are now employed for nearly every large use.

The Union Metal Manufacturing Co. impresses on planners of city lighting the superiority of Union metal lamp standards for modern white way lighting.

The American Conduit Manufacturing Co. offers the contractor an opportunity to participate in the results of its big spring drive to popularize Wiremold.

Westinghouse Electric & Manufacturing Co. illustrates and describes the 49 panel switchboard installed for the new Pittsburgh municipal and county building. A striking indication of thirty years' progress in A. C. generator construction is presented by a picture of a 70,000 kw. turbo-generator set compared with a machine advertised in 1887. The Type OA watthour meter is also presented as the culmination of three decades of meter progress.

The R. Thomas & Sons Co. shows various types of insulators for use in overhead line construction.

Western Electric Co. features three types of electric washing machines, backed by its sales service.

The Robbins & Myers Co. demonstrates the strength and rigidity of Robbins & Myers fan motors.

Ward Leonard Electric Co. gives emphasis to a hardy resistance unit designed to be slipped into a fuse block.

National Lamp Works lays stress upon the high quality of National Mazda lamps, and upon sales help accorded.

Baker-Joslyn Co. brings out the advantages of using Joslyn hot galvanized pole line hardware for line construction.

Standard Underground Cable Co. advises of its facilities for delivering the highest quality electric wires and cables.

V. V. Fittings Co. is doing its bit in supplying vapor-proof fittings and safety devices for building the new merchant marine.

Century Electric Co. features quiet operation as another one of the permanent characteristics which distinguish Century motors.

L. Plaut & Co. reproduces an advertisement of the Four-in-one Light which is being given a nation-wide popular circulation.

The Locke Insulator Manufacturing Co. has appointed the Pacific States Electric Co. as exclusive sales agent in the Western States.

American Electrical Heater Co. attractively displays "American Beauty" heating devices as a means for building up a permanently successful business.

Ivanhoe-Regent Lamp Works calls attention to the Ivanhoe Reflecto-Cap Diffuser, a new lighting unit which permits night work on former day processes.

Garland & Affolter Engineering Co. features Peerless Fans for 1918, and emphasizes the excellent mechanical and electrical characteristics of Howell polyphase motors.

Landers, Frary & Clark pictures Universal electric heating devices which are especially appropriate for gifts, and suggests the advisability of a stock to meet the coming demand.

General Electric Co. advertises that compression chamber lightning arresters insure continuity of line service. This company also devotes a page to the meaning of Mazda Service in lamp manufacture. Announcement is made of "The Electrical Advertiser," a help for dealers selling G-E apparatus.